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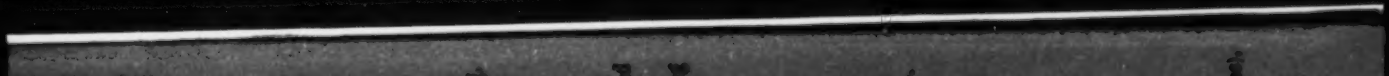

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1914—1915.

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NOTICES.

The Institution as a body is not responsible for the Statements or opinions expressed in any of its Publications.

Copyright. The entire contents of the Journal are covered by general copyright, and official permission is necessary for reprinting long abstracts; but editors may use not more than three pages of any paper, provided that credit is given at the beginning or end, thus:—"Reprinted from The Journal of The Institution of Petroleum Technologists."

Issue of Journal. Notice of the publication of each part of the Journal is contained in the first subsequent circular issued to the members, and in case of non-receipt, immediate intimation should be given to the Secretary. Duplicate copies of any parts can only be supplied to members on payment of 5s. each, plus postage; but cannot even then be had if the parts have been stitched together into volumes.

Change of Address. It is particularly requested that members notify the Secretary immediately, of any change of address; and members are also requested to advise the Parcel-Post Department as well as the Letter Office, of any temporary change of address, as, unless this is done, parcel-post packets will not be re-addressed; but will be returned to the office of the Institution in London, thus incurring further expense for postage.

Addresses Wanted. The Secretary will welcome any information as to the present address of any of the following members:—

Moon, F. W., late of c/o Langkat Oil Co., Langkat, Tandjong Poera, Sumatra, O.K.

Esling, F., late of Minatitlan Refinery, Minatitlan, Vera Cruz, Mexico.

Formation of a Library. Consideration is being given to the question of the formation of an adequate Library for the Institution; and the Council will be pleased to receive books on Petroleum Technology, etc., or sets of proceedings of any of the engineering societies, in order that this object may more readily be attained.

To Authors of Papers. Papers should be written in the third person, and the copy should be carefully corrected by the author before it is presented.

All drawings, diagrams or other illustrations should be in such a state for direct photographic reproduction.

All quotations, technical terms, and localisms should be indicated by means of inverted commas.

All foreign weights, measures, and costs should be given whenever possible; and also their English equivalents.

It is suggested that authors append as complete a bibliography of the subject treated, as may be possible.

All papers and notes submitted to the Institution are supposed to be original communications unless distinctly stated to be otherwise, in which case the exact reference to the previous publication should be given.

Advertisements in the Journal. A limited number of advertisements of firms interested in the Petroleum Industry, may be inserted in the Journal. Applications for terms, etc., should be made to the Secretary.

LIST OF ADVERTISERS.

Members are desired, when making enquiries or placing orders, to mention that they have seen the firm's advertisement in the Journal.

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Oil Well Supply Co. .. .. .. Outside Back Cover.
University of Birmingham .. .. Page vi.

PERSONAL NOTES OF MEMBERS.

It is suggested that Members of the Institution send information regarding their movements to the Secretary for insertion under this heading.

The PRESIDENT and Lady REDWOOD have issued invitations to a Reception at "The Cloisters," Avenue Road, Regent's Park, on July 18th, to meet the VICE-PRESIDENT and Lady COWDRAY.

Dr. T. O. BOSWORTH, M.Inst.P.T., is visiting the oilfields of Alberta, Western Canada.

Mr. H. T. BURLS, M.Inst.P.T., returned in April from Somaliland, East Africa.

Mr. EDWIN R. BLUNDSTONE, M.Inst.P.T., has returned from a visit to Galicia.

Professor JOHN CADMAN, M.Inst.P.T., is about to pay an official visit to Trinidad.

Major A. COOPER-KEY, M.Inst.P.T., has been made a Companion of the Bath.

Mr. E. H. CUNNINGHAM CRAIG, M.Inst.P.T., has been examining the Alberta oilfields in Canada, since April, but is shortly expected to return to London.

Mr. ARTHUR W. EASTLAKE, M.Inst.P.T., has almost recovered from a severe illness, due to pneumonia contracted during a visit to Russia in March, and his presence in London again, is greatly welcomed by his numerous friends.

Mr. W. H. FORDHAM, A.M.Inst.P.T., is again in London.

Mr. W. E. GUTTENTAG, Stud.Inst.P.T., has received an appointment in Rumania.

Mr. G. W. HALSE, A.M.Inst.P.T., is with Mr. E. H. Cunningham Craig, in Canada.

Dr. J. A. LEO HENDERSON, M.Inst.P.T., is to return to London from New Brunswick, Canada, at the end of July.

Mr. F. A. HOLIDAY, M.Inst.P.T., left for Russia in April and is expected to be away until October.

Sir THOMAS H. HOLLAND, K.C.I.E., M.Inst.P.T., is leaving for Australia on July 1st to be President of the Geological Section of the British Association. He proposes afterwards to make a tour in India, returning to England in January, 1915.

Mr. S. Lister James, A.M.Inst.P.T., is shortly arriving from Persia.

Mr. E. Lawson Lomax, A.M.Inst.P.T., has just returned from Persia.

Mr. W. H. MacGarvey has received the Imperial Order of the Iron Cross of Austria.

Mr. B. F. N. Macrorie, M.Inst.P.T., left for Trinidad, in April.

Mr. Ernest Parsons, A.M.Inst.P.T., is shortly returning to India.

Mr. F. G. Rappoport, M.Inst.P.T., who has been in S. America for some months, is expected to return shortly to London.

Sir Boverton Redwood, Bart., President, has been appointed President of the Junior Institution of Engineers.

Mr. C. B. Rosenplaenter, M.Inst.P.T., has paid several professional visits to Galicia, but is again in London.

Mr. F. A. Strickland, Stud.Inst.P.T., is shortly leaving for an appointment in Rumania.

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EDITORIAL.

THE growing appreciation of the importance of science to industries has led to the adoption of systematic procedure in the collection and diffusion of specialised information, and the tendency in all civilised countries is more and more in the direction of closely-defined limits of scope, or in other words of increased specialisation. Thus the widely-embracing subject of engineering is no longer represented by a single English engineering society or by periodical literature dealing with it comprehensively, and, although the multiplication of societies and journals is attended with obvious disadvantages, it is generally recognised that these are largely outweighed by the resulting benefits, and that the interests of those engaged in any important industry can best be promoted by affording facilities for assembling under a distinctive banner.

The position to which the petroleum industry has attained is such that the creation of a separate society for the benefit of those who are actively engaged in it is fully justified, and in these circumstances no apology is needed for the action taken last year by 29 men of note in the petroleum industry in founding "The Institution of Petroleum Technologists."

The new Institution, which has been duly incorporated under license from the Board of Trade, and has, therefore, a corporate status, will deal with the applications of geology, chemistry, and engineering to the needs of the industry which it represents, and its founders hope to show that it is worthy of recognition, encouragement and support from the older societies concerned with these branches of science.

Although The Institution of Petroleum Technologists will be a highly specialised organisation, the scope of its work will be far from narrow, and it is not impossible that in years to come it may itself, with the further growth of knowledge, become the parent of other even more highly specialised societies dealing with separate branches of the subject which it at present embraces.

In the meantime it will afford means for the geologists who devote special study to the occurrence of petroleum and bituminous minerals, for the engineers who are engaged in the application of mechanical skill and inventive faculties to the improvement of the means of raising, transporting and storing the raw material, and for the chemists who are employed in the conversion of the raw material into commercial products, to study and discuss questions

of common interest, and to acquire in this way knowledge which cannot fail to be of the highest value to themselves, to those for whom they are working, and to the industry in general.

It may, therefore, be confidently asserted that the Institution is worthy of the most cordial support of all those who are interested either professionally or commercially in the petroleum and shale-oil industries, and this view is amply endorsed by the enthusiastic character of the proceedings at the largely attended Inaugural Meeting held at the House of the Royal Society of Arts on the 3rd March last, and by the unanimous approval expressed in the general and technical press. All the leading periodicals, including *The Times* and other daily newspapers, the engineering, mining, and chemical journals, gave prominence to their notices of the formation of the Institution, and many devoted considerable space to articles descriptive of its objects, and highly commending the action which had been taken. Amongst the publications in which notices appeared were :—*The Times, The Standard, The Morning Post, The Daily Telegraph, Pall Mall Gazette, The Evening Standard and St. James' Gazette, The Financial News, The Financial Times, The Financier and Bullionist, City Press, Manchester Courier, Aberdeen Free Press, Belfast News-Letter, The Mining Journal, The Mining Magazine, The Petroleum Review, The Petroleum World, Oil News, Petroleum, Oil Age, The Engineer, Engineering, The Practical Engineer, The Mining World and Engineering Record, Sanitary Record and Municipal Engineering, The Chemical Trade Journal, The Colliery Guardian, Cassier's Magazine, Chemiker Zeitung, Iron and Coal Trades Review, Journal of the Society of Arts, Journal of Gas Lighting, Grocer and Oil Trade Review, Page's Weekly, The English Mechanic, The Grocers Gazette, Nature, Fair Play, Ironmonger, Pharmaceutical Journal, Motor Traction, Automobile Journal,* and the *Autocar.* As illustrations of the friendly and encouraging attitude of the Press, the following excerpts from *The Mining Journal* and *The Mining Magazine* may be given.

"The Institution of Petroleum Technologists.

"The inaugural meeting of the Institution of Petroleum Technologists was held at the House of the Royal Society of Arts last Tuesday evening, and a report of the proceedings appears in another column of this issue. The large hall of the Society was fully occupied and those present followed with lively interest the statements and views put forward by Sir Boverton Redwood and his colleagues on the Council. Owing to a variety of circumstances the interest felt was far wider than usually attends the birth of an Institution formed to preside over the fortunes of a section of

our engineering or technical industries. In the first place there is the subject. Oil is a matter which has been brought home directly to popular interest in the last few years to an extraordinary extent. It is widely recognised that upon the possession of adequate reserves of oil fuel and a corresponding organisation for their economic and reliable supply at all strategical points, the effective power of modern navies depends hardly less than on numbers and fighting capacity of individual ships. In quite a different direction the public is deeply interested in the supply of spirit of low flash point for internal combustion engines, especially in the great motor industry, which already ministers so greatly to convenience and luxury in passenger traffic, and with the guarantee of sufficient fuel at cheaper rates bids fair to become not less important for commercial transport.

Curiosity was further stimulated by the expectation afforded by the *personnel* of the Council—suggesting as it did co-operation with certain departments of our national administration—that some attempt to frame a constructive policy in regard to the exploitation of the oil industry, so far as British capital and British territory at least are concerned, might form a section at any rate of the activity of the new Institution.

For reasons which must be obvious to all, the full schemes of the promoters involve too many delicate questions to be embodied in any kind of formal prospectus, though enough was said at the meeting on Tuesday to indicate that a very definite scheme has been thought out in certain directions, and one which is bound to give important practical results. To these we shall refer in a moment. There are, however, certain wider aspects suggested by administrative developments in the last two or three years which seem to suggest that the programme outlined officially may be but a part of a much larger whole. It is, we think, generally accepted among those who have interested themselves in the question, that the reluctance of the Admiralty to commit themselves entirely to liquid fuel—at any rate, for all combatant vessels—is due solely to the difficulty of securing adequate and permanent supplies; and, in fact, the return to partially coal burning ships in the latest units under construction, as well as the omission of general naval manœuvres this year, is generally accepted as evidence in the same direction. The problem seemed difficult, if not impossible, of satisfactory solution so long as oil supplies had to be derived from foreign fields, since the commercial control of the oil industry rests ultimately in so few hands that the difficulties of securing independent supplies were not easily surmounted. The speakers, however, who addressed the Institution, and of the competence of whose opinion there can be no question, were in the happy position of assuring us that oilfields would be developed in British territory ere long sufficient for all such requirements; but without some further provision for national control over enterprises formed to exploit such deposits, it is clear that the position of the Admiralty would be little better than if they had still to rely upon such fields as Mexico, California, or Roumania.

Some scheme, therefore, which would secure the Imperial authorities an

adequate control of the supplies of oil from our various Colonial fields at times of any crisis or difficulty might well become a matter of Imperial policy. Nor are we without some evidence that events are trending in this direction. The Trinidad Ordinance dealing with the winning and carriage of oil, the recent Indian mining rules which we discussed a fortnight ago, and reports of measures discussed in Canada, give considerable colour to the idea that a general policy is, at the instigation of the Admiralty, being followed in the matter. Nor should the remarkable programme sketched by Mr. Churchill in explaining the Naval Estimates last year (*M. J.*, July 26th, 1913, p. 707) in the direction of establishing a State industry be forgotten in this connection. It is obvious, however, that a policy of this kind demands for its success an adequate supply of British engineers and employees, and that, as was pointed out by more than one speaker at the Meeting, has not existed hitherto, and it will be one of the chief objects of the Institution to provide it, in the first instance by giving its opinion as to who are competent engineers at the present time, and as rapidly as possible securing fresh recruits to the ranks both of engineers and foremen, by arranging courses of instruction which will give the desired technology. The Institution will exist, therefore, rather to assist in regulating and directing the industry than as a forum for the presentation of papers. Though we do not suppose that this aspect of activity will be ignored.

Another important field claiming the activities of the Institution will lie in the direction of co-ordination with the representative petroleum associations abroad. Whether an international association of petroleum technologists will be possible or not the future alone can show, but there are an ever growing number of special points present at once to the minds of those commercially interested in the subject demanding the establishment of common practice and co-ordination of standards as well as the internationalising of regulations as far as possible. These are matters almost postulating the existence of some authoritative body, and, if for no other reason, the foundation of the new Institution will be justified for the work to be done in this sphere.

There are numerous other aspects of the work which the Society may undertake which will spring readily to the minds of our readers but which space does not permit us further to discuss at the moment. A word or two, however, must be said on the possible difficulties which the special character which the Institution has adopted suggest may have to be encountered. It is perfectly obvious that when a society has to be formed, as we submit has been shown was necessary in the present case, certain individuals have to take the lead in its organisation. If the result of their operations affects the interests of other individuals or groups, the question of their mandate is certain to be raised. Now, so far as we can understand, the new Institution will take a firm line as to whom they will admit into their ranks, and they propose to make their membership select rather than numerous. Naturally all those who aspire to success as technologists in oil, so far as British undertakings are concerned, will be practically bound to secure admission. The tone of all the speakers at the

meeting suggests that a considerable proportion of "oil experts" who have figured in the past will not be accepted, at any rate on their present records. The Institution, therefore, seems certain of a considerable amount of active hostility. Experience shows us that criticism in cases of this kind usually takes the form of suggesting that the governing body are a clique unrepresentative often of the general opinion of their members. The answer to all such complaints lies in a frank explanation of the constitution and policy adopted. At present it is obvious that the delicate nature of the preliminary steps necessary have made any general statement out of the question, but we think that now the Institution has been formally launched, applications for membership solicited, and a standard of fitness set up, that the Society will be well advised to take the profession into its confidence as to the lines upon which it proposes to work, and the constitution under which the Council will exercise their extensive powers. Some criticism has already been heard that the Institution is not truly a technical one, since the nominated Council includes commercial leaders like Lord Cowdray, Sir Robert Balfour and Mr. Cargill. To our mind the great weakness from which close technical societies are apt to suffer is that they tend to drift out of touch with those practical commercial considerations which, in the long run, govern every industry, and by securing the counsel and support of men holding the position of the three gentlemen named above, the organisers appear to us to have secured themselves to a large extent against a very common source of weakness. It has not, however, been realised by such critics that this is an exceptional power reserved by the Council for individuals of very special standing, and there is, we understand, no intention of applying the practice to membership generally.

In conclusion, it only remains to wish the Institution of Petroleum Technologists all possible success, and—as it is to the efforts of individual members of the Council that we largely owe the high expectations entertained generally of the magnitude and prosperity which the industry will attain under British auspices as compared with the comparative failure of past efforts—we feel sure that they will realise the magnitude of their responsibility and the earnestness of the hope that their expectations will be realised in all departments."—*The Mining Journal.*

"Institution of Petroleum Technologists.

"The inaugural meeting of the Institution of Petroleum Technologists was held on March 3 at the hall of the Royal Society of Arts in John Street, Adelphi. To judge by the large attendance and the serious enthusiasm of the audience, this new institution has been launched with every prospect of a successful and useful career. To have any other first president than Sir Boverton Redwood was unthinkable, for he is the doyen of the world's petroleum technologists. At the meeting he made a dignified statement formulating the aims and objects of the organization. The commercial element does not come within its scope. There is no desire to push the advantages of petroleum and its products in their applications as producers of power and light or as lubricants. The sole

aim is to advance the scientific treatment of petroleum problems in their geological, chemical, and mining aspects, and to promote the better training of the future leaders of the petroleum industry. In fact, the institution is to be professional, and the aim is to secure a high level as regards knowledge, training, and reliability. The earnestness of the council is indicated by the fact that unusual care has been taken in settling rules and regulations and that the views of the city's leading solicitor and auditor have been sought as to the steps necessary to qualify for incorporation. After Sir Boverton's inaugural statement, three short addresses were delivered by Sir Thomas Holland, Mr. E. H. Cunningham Craig, and Mr. Vivian B. Lewes, respectively, the first being strictly technological and the other two in the nature of amplifications of the presidential statement. Sir Thomas Holland's address was devoted to the geometry of the various asymmetrical anticlines, and gave mathematical directions for tapping the crests of the successive oil-bearing beds. Mr. Cunningham Craig, with characteristic courage, said that the public and the financiers had to be taught the elements of petroleum geology and that petroleum mining must be put on a strictly business footing. Some of those present received a cold douche when he said that petroleum mining had to be placed on a securer basis than gold mining, 'which at the best was only an attractive gamble,' and the blow was not softened by the ripple of laughter that greeted his remark. This incident suggests that we have still much work to do in urging the regularization of business connected with metalliferous mining, and that the Institution of Mining and Metallurgy has a destiny to fulfil. Mr. Cunningham Craig clearly indicated the necessity for the geologist and the engineer being independent of the financier, and his own conduct has conformed to this ideal principle. Is it not possible for more of our metal-mining engineers to take this strong attitude, instead of being content to be merely the hirelings of the manipulators of markets? Mr. Cunningham Craig was also eloquent on the lack of opportunities in England for specialized training in connection with petroleum, and commended the action of Mr. John Cadman, professor of mining in the University of Birmingham, for his enterprise in establishing a course where geology, chemistry, and mining are taught from the point of view of the petroleum technologist. By means of this school it is hoped to train native talent for the multitude of posts now offered. At the present time chemical advice is sought on the Continent, and engineers and drillers are brought from America or Galicia. The concluding address, by Mr. Vivian Lewes, called attention to the chemical side of the subject, as affording the possibility of even greater prizes than the geology and engineering. The removal of troublesome sulphur compounds affords an important field for research, and the production of petrol products from petroleum by 'cracking' or otherwise is an equally attractive subject. Altogether the impression received by us as regards the tone of the meeting was distinctly favourable, and we look forward to the Institution playing a useful rôle professionally and technologically."—*Mining Magazine.*

Some of the intelligent and thoughtful criticisms of the able Editor of *The Mining Journal* might at once be answered, but it will probably be better that the work of the Institution should gradually supply its own answer.

It is intended that the *Journal of The Institution of Petroleum Technologists*, of which this is the first issue, shall be published at regular intervals, but this cannot be assured until an adequate reserve of material has been accumulated, and as this depends mainly upon the active co-operation of the Members it is hoped that those who are in a position to do so will furnish such information, whether in the form of papers for discussion or other communications, as is likely to be of general interest.

It will be the aim of those who are responsible for the conduct of the proceedings of the Institution to keep in view, not only the applications of science to the various branches of the industry, but also the results of research work in pure science in relation to questions which may prove to have far-reaching industrial effects.

Applications for membership have been received from many distant countries, and it is evident that those who are resident abroad realise that the advantages of belonging to such an Institution will not be confined to those who are able to attend the meetings.

The claims of the applicants are in all cases subjected to careful scrutiny and consideration by the Election Committee and by the Council before the Ballot Lists are prepared, but Members are reminded that the system of ballot adopted places upon each of them personal responsibility in regard to the election. To insist upon too high a standard of qualification would defeat the aim of the Founders of the Institution, but on the other hand it is essential that obviously unsuitable candidates should be excluded, and the thoughtful examination of every ballot list, to be followed by the deletion of any name in respect of which there is sufficient ground for such action and the return of the list, is a duty which should not be neglected.

It is only in this way that the high value which should attach to the membership of the Institution can be created and maintained, and that the hopes expressed by the President in his address can be fulfilled, with the result that those seeking assistance in carrying out petroleum enterprises will naturally turn to the Institution's Register of Members for guidance in the selection of men to co-operate with them.

INAUGURAL MEETING.

The Inaugural Meeting of this Institution was held at the House of the Royal Society of Arts on March 3rd, 1914, the first President, Sir Boverton Redwood, Bart., occupying the chair. The following members of the Council of the Institution were present, and there was a large attendance of members and others interested in the petroleum industry :—Mr. Alfred C. Adams ; Dr. George T. Beilby, F.R.S. ; Mr. Edwin R. Blundstone ; Professor John Cadman ; Major A. Cooper-Key, C.B. ; Mr. E. H. Cunningham Craig ; Sir Thomas H. Holland, K.C.I.E., F.R.S. ; Professor Vivian B. Lewes ; Mr. T. C. Palmer ; and Mr. Robert Redwood.

Among other important members who were prevented from attending was Sir Thomas B. Bowring, who was absent through ill-health, and Mr. Arthur W. Eastlake, who telegraphed from Baku, " Wish Institution every success, regret absence."

PRESIDENTIAL ADDRESS.

Sir Boverton Redwood, Bart.

It is a good omen that The Institution of Petroleum Technologists should be permitted to hold its Inaugural Meeting in this House, for as my friend, Sir Henry Trueman Wood, has recently reminded us in his admirable history of the Royal Society of Arts, that Society, which was itself founded in 1754, has assisted at the birth of many flourishing institutions of a similar description.

Thus, the Chemical Society, whose rooms are now at Burlington House, was founded at a meeting held in the Society of Arts' House in 1841, and for some time afterwards its members met here periodically.

For many years the scope of the activities of the Society of Arts was very wide, and the Society was instrumental in the dissemination of information about the industrial arts and sciences in general, as well as being the recognised channel of publication of new discoveries and inventions of an industrial character.

Before long, however, it had to contend with the competition of many other institutions, the demand for which arose from the growth of specialism. Thus, by the end of the first half of the nineteenth century there had been founded the Royal Academy,

the Linnean, Geological, Chemical, Agricultural, and Geographical Societies, the Royal Institution, the London Institution, the Institutions of Civil Engineers and of British Architects, all occupying ground once left to the Royal Society and the Society of Arts.

There still remained work for the Society in the domain of industrial chemistry, and in 1874 a special Chemical Section was formed to deal with it, but this section came to an end in 1886, the Institute of Chemistry and the Society of Chemical Industry having meanwhile been formed, the former in 1877 and the latter in 1881.

With commendable self-sacrifice the Society of Arts has, in every instance, made way for and encouraged these new comers by no longer giving facilities for the discussion of subjects which they were specially created to deal with, and it is further evidence of this generous attitude that we are assembled here this evening, for there have been many valuable lectures given and papers read on subjects which lie within the province of our new Institution, in addition to a course of Cantor Lectures delivered in 1886, which modesty precludes my putting into that category.

It is not, however, a desire to provide a new channel for the dissemination of knowledge relating to petroleum, or a special arena for the contests of mental gladiators over controversial questions, which has led to the formation of our Institution. We want to do something which no other society or institution can do for us, viz., to establish a hall-mark of proficiency in connection with our profession, and I think it will be conceded that this action has been taken none too soon.

As I recently pointed out, in an address to another institution, the great development of the petroleum industry and especially the multiplication of centres of activity where British capital has been embarked in that industry, have rendered it increasingly difficult to procure the services of properly trained geologists, engineers, and chemists, with the result that positions of responsibility are given either to incompetent Britishers or to proficient men of other nationalities.

Moreover, in the absence of any means of gauging the capacity of those who proffer advice, whether in the form of technical reports or otherwise, capitalists are often induced to give credence to untrustworthy statements, and are thus led astray, money being wasted and discouragement created.

The aims of our Institution are :—

(*a*) To enable technologists engaged in the petroleum or shale

oil industry to meet and to correspond, and to accumulate trustworthy information regarding the occurrence and production or winning of petroleum and oil-shale, the conversion of the raw materials into manufactured products, and the characters and uses of these products, together with their transport and storage.

(*b*) To promote the better education of persons desirous of becoming professional consulting petroleum technologists, petroleum engineers, geologists, or chemists, and to elevate the professional status of those employed in the petroleum industry by setting up a high standard of scientific and practical proficiency, and by insisting upon the observance of strict rules in regard to professional conduct.

In pursuance of the policy thus outlined it will be our general aim to do all that lies in our power to advance the welfare and safeguard the interests of those who qualify themselves for the profession of petroleum technologists, and in this manner we shall strive also to be of service, individually and collectively, to the industry.

In our membership we shall aim rather at high qualification than at numerical strength, and we hope that the time is not far distant when our register of members will be consulted by those who are in want of skilled guidance and assistance, whether geological, engineering or chemical, in the carrying out of petroleum enterprises in which British capital has been invested.

The Institution is so constituted that some of the members may at times find themselves in the position of employers and employed, but among ourselves we shall recognise no such distinction, for we shall meet on common ground with the common object of co-operating in advancing the interests of all who are concerned in the further development of the great and growing industry with which we are connected.

If our work prospers it will become of national importance, and it is a hopeful feature that we have already been recognised by being consulted by the Government in regard to a proposal for the establishment of an International Petroleum Institute.

Our Council is thoroughly representative in character, and may be confidently depended on to deal wisely and impartially with any matters within their province. We have also been fortunate in having secured the valuable services in the respective capacities of Honorary Solicitor and Honorary Treasurer of Sir Frank Crisp and Sir William Plender.

One of our first actions has been to give the Institution a defined corporate position through the medium of incorporation, and in

the Linnean, Geological, Chemical, Agricultural, and Geographical Societies, the Royal Institution, the London Institution, the Institutions of Civil Engineers and of British Architects, all occupying ground once left to the Royal Society and the Society of Arts.

There still remained work for the Society in the domain of industrial chemistry, and in 1874 a special Chemical Section was formed to deal with it, but this section came to an end in 1886, the Institute of Chemistry and the Society of Chemical Industry having meanwhile been formed, the former in 1877 and the latter in 1881.

With commendable self-sacrifice the Society of Arts has, in every instance, made way for and encouraged these new comers by no longer giving facilities for the discussion of subjects which they were specially created to deal with, and it is further evidence of this generous attitude that we are assembled here this evening, for there have been many valuable lectures given and papers read on subjects which lie within the province of our new Institution, in addition to a course of Cantor Lectures delivered in 1886, which modesty precludes my putting into that category.

It is not, however, a desire to provide a new channel for the dissemination of knowledge relating to petroleum, or a special arena for the contests of mental gladiators over controversial questions, which has led to the formation of our Institution. We want to do something which no other society or institution can do for us, viz., to establish a hall-mark of proficiency in connection with our profession, and I think it will be conceded that this action has been taken none too soon.

As I recently pointed out, in an address to another institution, the great development of the petroleum industry and especially the multiplication of centres of activity where British capital has been embarked in that industry, have rendered it increasingly difficult to procure the services of properly trained geologists, engineers, and chemists, with the result that positions of responsibility are given either to incompetent Britishers or to proficient men of other nationalities.

Moreover, in the absence of any means of gauging the capacity of those who proffer advice, whether in the form of technical reports or otherwise, capitalists are often induced to give credence to untrustworthy statements, and are thus led astray, money being wasted and discouragement created.

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One of our first actions has been to give the Institution a defined corporate position through the medium of incorporation, and in

carrying this out Sir Frank Crisp has given us his personal assistance. We have not yet received our certificate, but the Board of Trade has approved of our constitution as drafted with only verbal amendments.

In the list of Founder Members are the names of many who have honourably distinguished themselves in building up the British interests in petroleum in various parts of the world, both in a commercial and in a professional capacity, and the list of elected Members, Associate Members, Associates, and Students, with those who are candidates, demonstrates that the creation of this organisation is cordially welcomed.

We, therefore, enter upon our career under auspices as good as they can be, and with the brightest prospects, the realisation of which now lies with the members themselves.

Some Geometrical Features of the Anticline.

By Sir THOMAS H. HOLLAND, K.C.I.E., D.Sc., F.R.S., *Member.*

INTRODUCTION.

IN giving the first of these three inaugural exercises, I gladly take the opportunity of congratulating the new Institution on securing as its first President one who has been by general consent recognised for many years among petroleum technologists throughout the world as *facile princeps*. My feeling of satisfaction is not, however, without a tinge of apprehension; for the obvious unconformity between our President and anyone who might to-day be reasonably regarded as his heir-presumptive may give our critics cause to recognise a distant analogy between the Institution and the average newly-struck gusher. It is to be hoped, however, that, after the initial and apparently inevitable falling off in elastic pressure, we shall settle down to steady production.

My successors to-night propose to deal with the way in which the activities of the Institution will affect the broader questions of educational and professional life. To add to the variety I propose to give only an extract from my University lectures on oil-geology, and thus deal with a problem of more direct interest to our younger members, and I have chosen the *anticline* as an object lesson because it is the most prominent figure in the coat of arms of the oil geologist.

The anticline to the oil prospector is like the quartz reef to the gold miner, and often is as treacherous. Whenever it can get a fair chance oil chooses for its resting place the higher parts of the anticlinal crest or dome; true, it is sometimes caught in other situations, some of them rather compromising, even to the notoriously vagrant character of oil, and it has even been reported in commercial quantities in synclinal troughs, though these occurrences are occasionally in areas where the tectonic features of the strata are well concealed by a mantle of vegetation and decomposition products.

There are two great classes of anticlines:—

(1) Those that are usually figured in the average text-book of geology, and

(2) Those that occur in Nature.

The former have limbs symmetrically disposed with reference to a vertical median plane, and their axes are as near the horizontal as the draughtsman can make them. The anticlines of nature

are, however, generally asymmetrical, with a pitching axis, which rises and falls as it rolls across the country in pythonesque undulations; the outward and visible shape is often also but a partial representation of its internal tectonic structure.

The problem of locating favourable well-sites in a series of petroliferous rocks that are folded, Jura fashion, into a series of alternating anticlines and synclines, narrows down mainly to a consideration of the local degree of asymmetry and the way in which the anticlinal axis pitches. Departures from these ideal conditions may force the geologist to take into serious account:—

(*a*) Excessive asymmetry resulting in the inversion of one limb,

(*b*) The local passage of folds into faults,

(*c*) The shearing of the limbs of the anticline, and

(*d*) The so-called diapir structures described by Professor Mrazec in Rumania.

The commonest problem before the oil geologist is that of locating a point vertically above some subterranean crest known or suspected to be petroliferous. In this essay I propose to discuss the geometrical features of the anticlinal fold merely with the intention of forming some mental estimate of what the usual pitfalls are and how much they really matter in ordinary practice.

To clear the ground we might just pass in rapid review illustrations* of the leading types of anticlinal folds, namely,

(1) The nearly symmetrical open anticline, which a parsimonious nature rarely provides.

(2) The closed anticline, in which the oil-pool is so narrow that one's neighbour is generally found already to have taken up the only valuable ground.

(3) The anticline which is asymmetrical to varying degrees, and may be broad, narrow, closed or carinate.

(4) The anticlinorium in which there may be oil abundant enough to provide wells in subsidiary synclines, or only sufficient to provide local pools.

One would have imagined that no one with an elementary idea of geometry would think it unimportant to take the degree of asymmetry into consideration; yet, among young geologists this error is nearly as frequent as their common impression that all coal is of carboniferous age. Every geologist present can recall instances of wells being drilled right on the visible crest of an asymmetrical anticline; others which have been drilled on the wrong side of the superficial crest; and still others which, although

* Not reproduced.

on the right side, have been located so as to be only partially successful. It ought not to be necessary to deal with more than the last group of cases, and my short essay, therefore, will be limited to a consideration of the rules which guide the geologist in choosing the most favourable location.

I will commence with illustrations in which the axis is so nearly level that the degree of pitch may be regarded as negligible; in practice, these cases are common, as only a very high degree of pitch will produce an error that is comparable to the factor of safety that must be provided to meet such sources of indeterminate error as, for instance, the compression and shearing of the limbs caused by the folding movements. These two disturbing features will be referred to in the sequel.

Asymmetrical Anticlines with Negligible Pitch.

When a bundle of beds are bent, anticline fashion, at a sharp angle the line joining the successive corners or crests bisects the

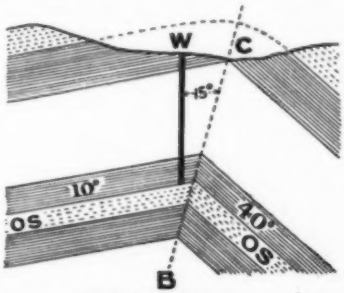

Fig. 1.—Location of a well (W) from the average dips of the anticlinal limbs.

angle between both wings or limbs of the anticline, as in Fig. 1, which shows an asymmetrical anticline with right and left limbs dipping respectively at right angles of 40° and 10°. To reach the crest of the oil-sand, OS, a well would be located at W, to the left of the visible crest, C, and on the gently-inclined limb.

There are three classes of such ideal cases to deal with:—

(*a*) Anticlines with limbs dipping in opposite directions, such as that illustrated in Fig. 1;

(*b*) Anticlines with limbs dipping in the same direction, without inversion; and

(*c*) Anticlines with limbs dipping in the same direction in consequence of overthrusting and resulting inversion.

The diagrams next following, and forming Figs. 2, 3, and 4, show geometrically how the angle between the vertical line and the crest (or apex) locus is calculated from the inclinations (dips) of the anticlinal wings.

Case (a).—With limbs dipping in opposite directions, the hade of the apex-locus is half the difference between the dips of the two limbs.

This case is illustrated by Fig. 2, in which CB represents the apex-locus, while CD and CE represent traces of the limb planes. The limb CD dips at the angle ACD = α, while the limb CE dips at the angle FCE = β. The crest-locus, CB, bisects the angle, DCE, between the limbs, and thus the angles DCB and ECB are equal. CG is a vertical line passing through the apex at the level AF. To make the demonstration more graphic, the angles DCB, BCG and GCE might be marked respectively m, h and n. Of these h, the angle between the vertical and the bisectrix, is, of

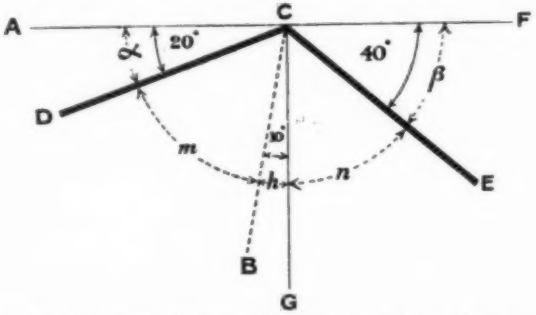

FIG. 2.—Anticline type (A): special example illustrated shows left dip = 20°, and right dip = 40°. Hade of apex-locus $\frac{40° - 20°}{2} = 10°$

course, the *hade of the apex-locus*, which is the angle always required in locating well sites on asymmetrical anticlines.

In this case, because the line CG is vertical while AF is horizontal :—

$$\beta + n = \alpha + h + m$$

And as the line CB bisects the angle between the wings—

$$m = n + h$$

Therefore,

$$\beta + n = \alpha + h + (n + h), \text{ and}$$
$$\therefore \beta = \alpha + 2h, \text{ or}$$
$$\beta - \alpha = 2h, \text{ and}$$
$$\frac{\beta - \alpha}{2} = h$$

In the special case illustrated by Fig. 1, the hade of the apex-locus is obviously $\frac{40^\circ - 10^\circ}{2} = 15^\circ$, while in Fig. 2 the hade is $\frac{40^\circ - 20^\circ}{2} = 10^\circ$.

Case (b).—With limbs dipping in the same direction, the hade of the apex-locus is half the sum of the two dips.

This case is illustrated by Fig. 3, in which a similar notation is used for the corresponding angles, namely—

α = the dip of the left wing
β = „ „ „ „ right wing
h = „ hade of the apex-locus, and
m and n = supplementary angles.

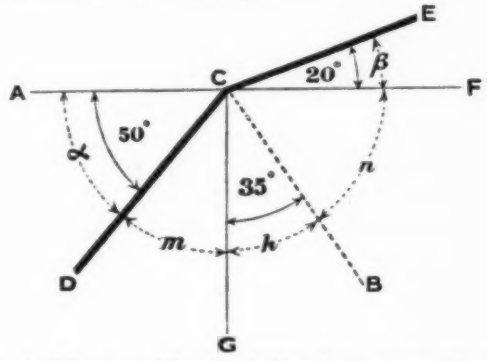

FIG. 3.—Anticline type (B). Illustration shows an example with two left dips of 20° and 50°. Hade of apex-locus = 35° right.

In this case as before—

$$\alpha + m = h + n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$h + m = \beta + n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Subtracting (2) from (1) we get—

$$\alpha - h = h - \beta, \text{ or}$$
$$\alpha + \beta = 2h \text{ and } \frac{\alpha + \beta}{2} = h.$$

Case (c).—With an inverted limb, and consequent dips in the same direction, the hade of the apex-locus is half the difference between the dip of the normal limb and the supplement of the dip of the inverted limb.

This case is illustrated in Fig. 4, in which α is the dip of the normal wing, while β is the supplement of the dip of the inverted wing. Then from the illustration, obviously—

$$m + n = h \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$\beta = 90^\circ + m \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$
$$\alpha = 90^\circ - (n + h) \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Subtracting (3) from (2)—

$$\beta - \alpha = m + n + h, \text{ and}$$

inserting the value of $(m + n)$ in this equation—

$$\beta - \alpha = 2h, \text{ and}$$

$$\frac{\beta - \alpha}{2} = h.$$

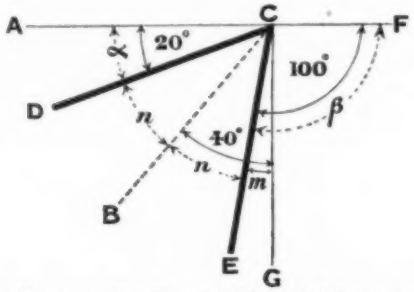

FIG. 4.—Anticline type (C). Example illustrated shows two dips to the left, the normal wing at 20° and the inverted wing at 80°. The hade of the apex-locus is thus $\frac{100° - 20°}{2} = 40°$

In locating a well, which is designed to strike some point on the apex-locus, it is obvious that the depth of the point and the hade of the locus are the first data to consider. The distance of the well from the visible crest can then be determined graphically, as in the case illustrated in Fig. 5, in which, with the hade h, and the depth DB, the well will be at the distance CD from the visible crest and on the gently dipping wing.

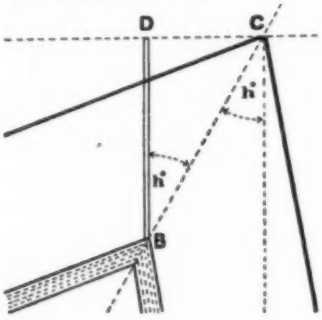

FIG. 5.—Diagram to illustrate the distance (D C), from the visible crest of a well intended to strike the subterranean crest B. The hade of the apex-locus is $h°$.

This distance can be determined also by simple trigonometrical calculation; for—

$$\frac{DC}{DB} = \tan h, \text{ and}$$
$$DC = DB \tan h.$$

Analysis of Folds.

The very simple cases illustrated by Figs. 1—4 assume the fold in each instance to be referable to two uniformly dipping limbs meeting at the point C. A fold is, however, rarely so simple, and the curves are generally so varied as to require more detailed analysis. In Fig. 6, for instance, the arch indicated by the broken

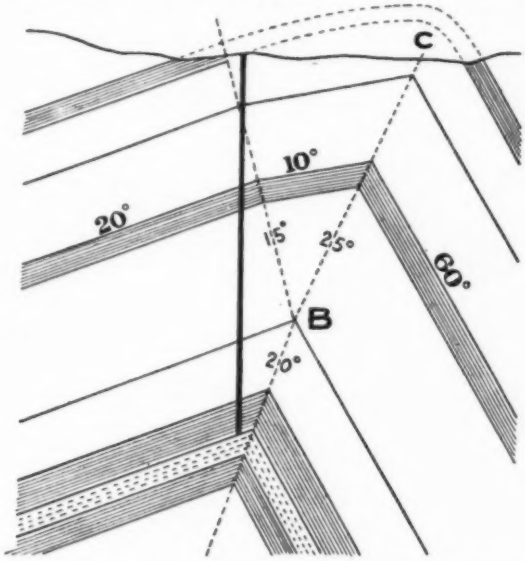

Fig. 6.—Illustrating the variation of the hade of the apex-locus.

lines can be referred to three plane surfaces, of which two, dipping to the left at 10° and 20° respectively, represent the gently inclined wing, while that dipping 60° to the right represents the steep wing or limb.

In such a case the crests hade at angles of $\frac{60° - 10°}{2} = 25°$, and $\frac{20 + 10}{2} = 15°$ respectively. These two crests meet below

at the point B, where the apex-locus changes direction, and is determined by the outer parts of the limbs that dip at 60° and 20°. The apex-locus below B has then a hade of—

$$\frac{60 - 20}{2} = 20°$$

In Fig. 7 a further refinement is shown by the determination of further dips at the surface on either side of the level part of the arch, namely, 10° and 20° to the left, and 30° and 60° to the right. In this case the crests converge with the following hades taken from left to right—

$$(1)\quad \frac{20 + 10}{2} = 15°$$

$$(2)\quad \frac{10 + 0}{2} = 5°$$

$$(3)\quad \frac{0 + 30}{2} = 15°$$

$$(4)\quad \frac{30 + 60}{2} = 45°$$

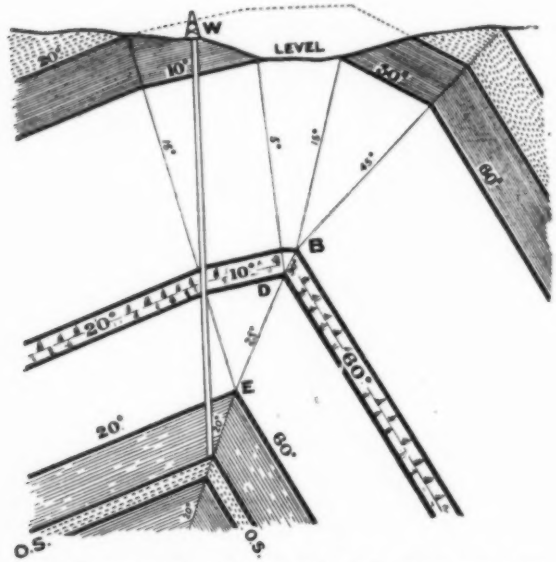

FIG. 7.—Illustrating the variation of the hade of the apex-locus.

The first two apex-loci to meet are those on the right, which coalesce at B, and then change direction with a hade of $\frac{0 + 60}{2} = 30°$

to D, where the next apex-locus is eliminated; the next series of crests below hade at an angle of $\frac{60-10}{2} = 25°$, meeting the next apex-locus at E, and continuing down with a hade of $\frac{60-20}{2} = 20°$ to the oil-sand OS, which can be tapped by a well located at W.

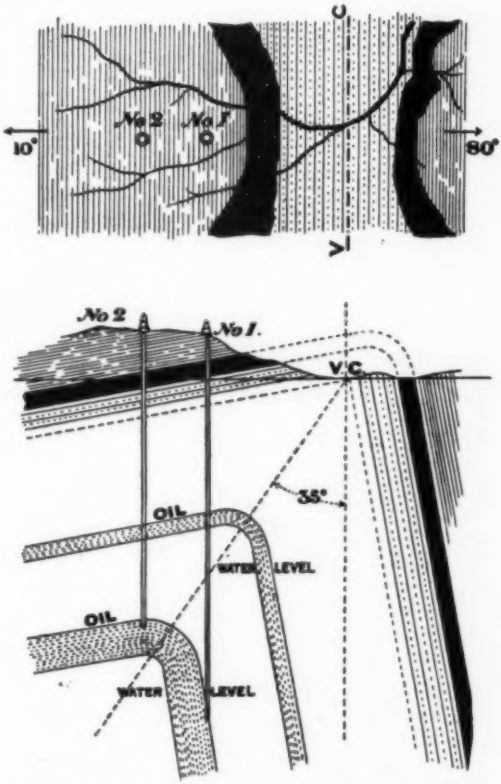

FIG. 8.—Map and section of an asymmetrical anticline to show the different prospects of two wells.

Frequently the opposite wings are so constant in dip and the arch so narrow that a subterranean crest can be located by consideration only of the two prevailing dips, as in the case illustrated in Fig. 8, which shows both the map and the section

of an anticline with limbs dipping at angles of 10° and 80°. The section shows how the well No. 1 passes through the productive part of an upper oil-sand and just misses the crest of one below, striking into the underlying water, and entering the steeply dipping beds so obliquely that the well is liable to be deflected from the vertical line. Well No. 2 would verify the existence of the upper oil-sand, and, at the same time, is situated conveniently to develop the lower productive sand.

The next feature to consider is the kind of error likely to arise from such an estimate of the apex-locus which is based only on

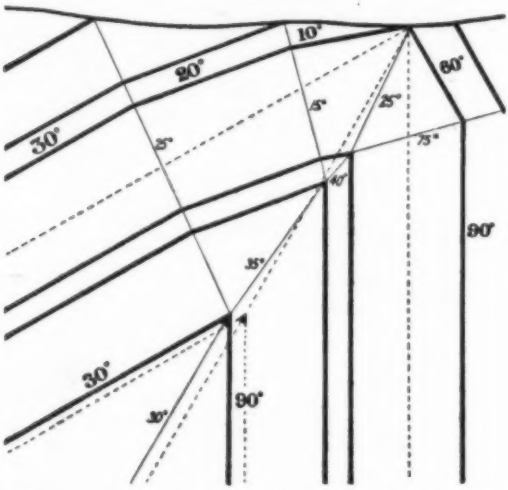

FIG. 9.—Illustrating the error due to location of an underground crest by calculation from the dips of the outer parts only of an anticline.

a consideration of the prevailing dips in the outer part of the limbs, that is, well away from the visible crest of the anticline. Two cases of the kind are illustrated in Figs. 9 and 10.

Fig. 9 illustrates an instance in which estimates based on the outer parts of the limbs only would result in the location of an underground crest on the steep, that is, the dangerous side of its actual position as determined by a more complete analysis of the curve. The heavy lines show the results of the detailed analysis, while the broken lines show the results of relying only on the prevailing outer dips.

In Fig. 10, representing an arch of different shape, a converse case is shown, in which, by relying on the prevailing outer dips, the subterranean crest is located on the safe side of its actual position as determined by closer analysis of the fold. It is thus important to consider the nature of the curve before deciding on the "factor of safety" required to be sure that a well will not just miss an underground crest of known depth. Obviously, it is desirable to avoid too much "safety," as the well would then be so far back from the crest as to lose some of the advantages

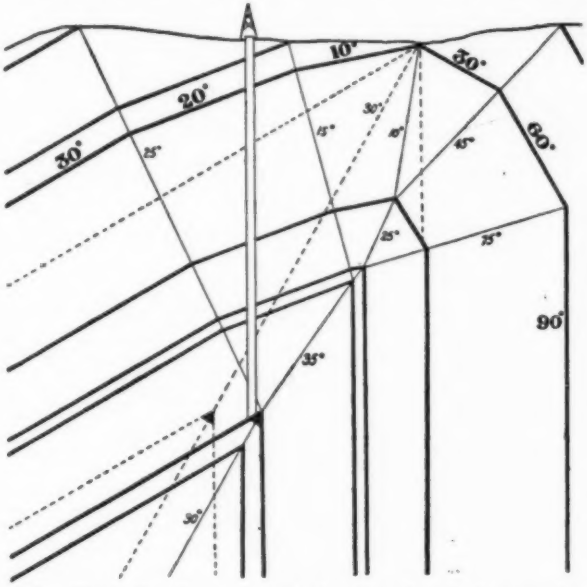

FIG. 10.—Illustrating the error due to location of an underground crest by calculation from the dips of the outer parts of an anticline only.

of gas-pressure. At the same time, it is important to remember that a well which exactly strikes the crest may be embarrassed by the local accumulation of gas.

CORRECTIONS FOR THE PITCH OF THE ANTICLINAL AXIS.

An ordinary oil-well is drilled with the intention of the boring going down vertically, and, although it does not always fulfil the expectation of the driller, one has to calculate for the ideal, and,

what is in practice an approximately true, condition. According to the pitch of the anticlinal axis a transverse vertical plane at right angles to the direction of the anticlinal axis will intersect the planes of true dip at some angle which can be determined from the map.

Thus, in drawing a vertical section across an anticline with a

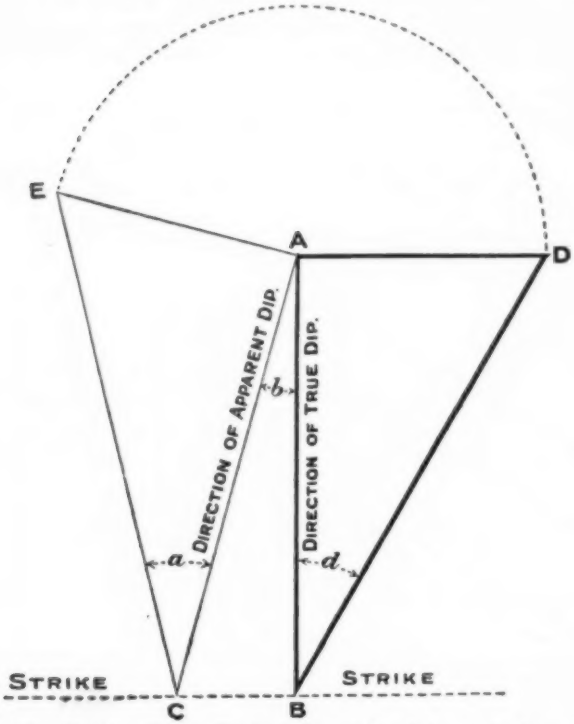

FIG. 11.—Construction to illustrate the relation between the true and apparent dips of a bed.

view of calculating the position of some underground crest, it is necessary to determine the apparent dips in the direction of the section, as these will be less than the true dips on either limb of the anticline.

The apparent dip can be calculated from the true dip by a well-known geometrical process illustrated by Fig. 11. In this

case AB is the direction of true dip, while AC is the direction of the apparent dip to be determined. The difference in the bearing of these two directions is *b*. The line drawn at right angles to the direction of true dip, AB, is the line of strike. Draw BD so as to meet AB at an angle equal to the true dip, *d*. Draw AD at right angles to AB and draw the perpendicular AE equal to AD and at right angles to AC. Join E with the point C, which is on the strike line. The angle ECA (*a*) is thus the apparent dip in the direction of AC. It is obvious that the apparent dip will be less with the increase of the difference of bearing between the direction of true dip and the direction of apparent dip.

The reason for this construction will become obvious if we cut the diagram along the lines AD, DB, AE and EC. We can then rotate both triangles on their bases so that E and D will be brought up to coincide vertically above the point A. The triangle ADB will then be a vertical section along the direction of true dip and the triangle ACE will be a vertical section along the direction of apparent dip. The triangle formed by bringing up the points E and D vertically above A will coincide with the plane of bedding, and this plane will include the strike line running through B and C.

Instead of making a geometrical construction it is possible to employ a trigonometrical equation which lends itself suitably to logarithmic calculation. Thus, in Fig. 11, $\frac{AB}{AD} = \cot d$; therefore, $AB = AD \cot d$, and similarly, $AC = AE \cot a = AD \cot a$. Also, $\frac{AB}{AC} = \cos b = \frac{AD \cot d}{AD \cot a} = \frac{\cot d}{\cot a}$. From this formula, $\cos b = \frac{\cot d}{\cot a}$, either angle can be calculated when the other two are known. In practice the angles *b* and *d* will be generally known, while *a* has to be calculated. The formula can thus be conveniently stated in the form—

$$\cot a = \frac{\cot d}{\cos b},$$

and this can be reduced to the logarithmic form—

$$L \cot a = L \cot d - L \cos b.$$

Now, it is obvious that if there is any appreciable pitch in the anticlinal axis the dips recorded on the opposite limbs will not be in line, but will meet at an angle on the crest. Judging by experience it is not unwise to remind the young geologist that an anticlinal axis is not an article that he picks up in the field; its direction and the degree of its pitch are merely calculated from the dip values obtained on the two limbs.

The relationships are shown graphically in Fig. 12, where AB is the direction of true dip on one limb and AC is the direction of true dip on the other limb. Now, if AB and AC are in length drawn to be proportional to the cotangents of their respective dips, the strike-lines BD and CD, which are at right angles to the directions of true dip, must be on the same horizontal plane and must meet at the point D. The line joining A and D will then be the plan of the anticlinal axis, which pitches from A and disappears below the horizontal plane CDB at D.

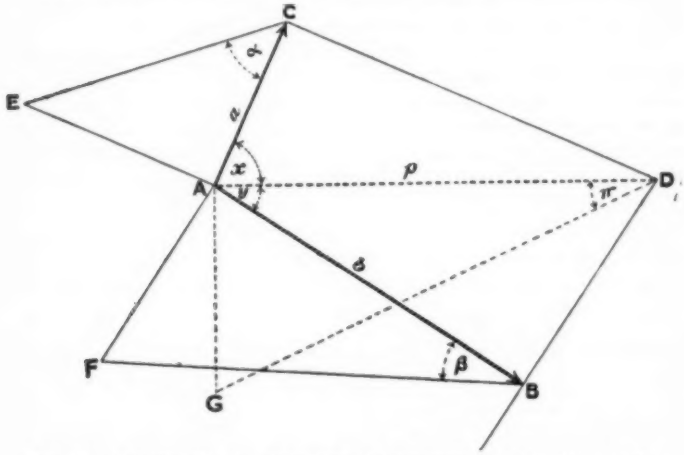

FIG. 12.—Construction to show how the amounts and directions of the dips on two wings determine the direction of an anticlinal axis and the degree of its pitch. A D = plan of anticlinal axis; A C = direction of dip on one limb; and A B = direction of dip on the other limb. A E = A F = A G. Dips = α and β. Pitch of anticline = π.

By adopting a similar construction to that used for showing the relation between the true and apparent dip, the three triangles ABF, ACE and ADG are constructed with vertical sides of the same length; so that, if they be rotated up on their bases, the points E, F and G can be made to coincide when all three triangles are vertical.

It is obvious from this construction that the amount and direction of the two limb-dips determine both the direction of the anticlinal axis and the degree of its pitch, and the relationship can be expressed trigonometrically. To simplify the formulæ a, b and p may be

used for the base lines AC, AB and AG. Then, as the vertical sides of the triangles are all equal—

$$a \tan \alpha = b. \tan \beta = p. \tan \pi.$$

But as ACD is a right angle, $\frac{a}{p} = \cos x$ and, similarly $\frac{b}{p} = \cos y$. We thus obtain the data for dividing the angle BAC (which is the difference in bearing of the two dips), into two parts in the ratio of their cosines.

Corrections for Shearing, Change of Curvature and Lateral Variation in Thickness.

In this sketch of the geometrical features of the anticline I have assumed the existence of folds of incompressible material; such materials of course never occur in rock folds. The process of folding results in extension of some parts of the anticline, compression of other parts, and in shearing of the limbs, which may locally pass into faults. The anticlinal folds, moreover, are never quite concentric curves; the curvature of a folded bed at the surface may decrease or increase in certain circumstances at lower depths. All these features affect calculations based on purely geometrical considerations, and the calculations, therefore, have to be corrected accordingly; thus, frequently the total amount of allowance cannot be determined with precision.

Another disturbing consideration, often greater than any source of error due to secondary changes brought about by the folding movements themselves, is the original lateral variation in the thickness of the beds concerned. Depths calculated from the thicknesses of measured outcrops may be found to be falsified, especially if the outcrops measured are at a considerable distance from the anticline which is to be tested. The kind and amount of lateral variation in the thicknesses of the different beds must be determined and applied as a correction to the estimates made from the purely geometrical proposition. It would make this address unduly long to attempt a discussion of these sources of error, but it is necessary to call attention to them to prevent the possibility of anyone relying on the purely geometrical considerations alone; they represent the ideal conditions which never actually exist in nature.

The Educational Aims of the Institution.

By E. H. Cunningham Craig, B.A., F.G.S., *Member.*

Mr. President,

I esteem it a great privilege, and at the same time a heavy responsibility that falls upon me this evening, that at the inaugural meeting of our Institution, I have been permitted to speak upon the educational work that is before us.

For it is quite evident to all who are interested in the development of oilfields in any part of the world, and in the refining and disposal of petroleum products, that this country is still lagging far behind other countries that are brought more directly into contact with the problems connected with that interesting and elusive fluid. Not only has the general public to learn much that is essential with regard to petroleum, not only have business men to discover that the search for petroleum is not by any means a haphazard undertaking, but even the scientific circles in Great Britain have to be made familiar with what has been accomplished in oilfield work and what is definitely established as to the habitat of petroleum. It is not so long ago since general courses of geological lectures at some of our oldest and most revered Universities contained absolutely nothing of any practical value on the subject of oil.

And it will be not the least important item in the active work of this Institution to throw light upon the hitherto obscure path of the oil finder and to make the subject of oilfield development understood and appreciated throughout the length and breadth of the land. Oil is in fact something new in this country, and it is not yet "understood of the people." Were it not so, I think we may safely assume that the good gold of London would not have been poured out so profusely over the ground of such fields as Maikop, where it has been buried so deeply that it is only with difficulty that a certain proportion is being recovered.

There is thus educational work before the Institution of various kinds, for the less mystery that is allowed to veil the subject of petroleum, the more confident will the public become in taking part in the development of oilfields and in utilising petroleum products, and the less will be the tendency to consider oil work as on a par with gold mining, an attractive gamble.

It is quite recently that Britain has awakened to the fact that it possesses and controls oilfields of great extent and promise, and

though in financial circles it seems to be the rule to decry any oilfield that is British, enlightenment will inevitably come with time and it will be realised that a new burden of Empire is set upon us, and must be shouldered to the best of our ability. And it is a burden for which the country has been unprepared. In how many instances have British petroleum companies to depend upon the service of foreigners, and we have the mortification of seeing the oilfields in British territory under the control of British financial groups being examined and reported on by Continental geologists, their refineries in charge of foreign chemists, and the drilling staff entirely American or Galician.

The Dominion of Canada has, fortunately, furnished many of our best managers, field superintendents, and drillers, but the supply has never been equal to the demand, and there is still a dearth of qualified technologists in every branch of the subject.

In consequence, we find that where the staff of a petroleum company is entirely British, mistakes, often of far-reaching consequence, are only too frequent in the initial stages of development.

This Institution has been formed to gather together all those interested or actively engaged in work connected with petroleum, whether engineers, chemists, or geologists, and to make it clear that the technology of petroleum is of sufficient importance to stand by itself, just as in mining, the metal mining has inevitably been separated from coal mining.

It is somewhat difficult to define petroleum technology and the petroleum technologist. The former is, in its broadest sense, a form of mining, yet it is not exactly mining: it borrows from engineering, from geology, and from chemistry.

The petroleum technologist may thus choose between three branches of the subject; he may be a chemist, yet it is not necessary that he should be versed in every branch of chemistry; he may be a geologist, and although almost every branch of geology may be useful to him, it is not necessary that he should have followed a complete academic course in geology; he may be a mechanical or mining engineer and yet it is not necessary that he should be qualified in all mining practices.

But the fully qualified petroleum technologist must have knowledge of all three branches and their bearing upon each other, even though he may elect to specialise in one. He must avoid the danger of being stigmatised as a hybrid on the one hand, and the danger of being too rigid a specialist on the other.

If not a new genus, he is at least a new type or variation; or more correctly, he is one of three species with many characters

in common, developed along similar lines from dissimilar ancestry.

This Institution's aim is to name, to foster the development of, and to explain these species to the British public.

The criticism may be made, I believe it has been made, that our Institution is, at the best, hardly necessary; that engineers, chemists, and geologists, can be produced in sufficient number as and when required. Though in a sense true, this disregards much that is essential: it is not the whole truth. Oil work is intensely practical, and it will be in the experience of many here to-night, what disastrous results have followed the appointment, for instance, of a coal-mining engineer in charge of an oilfield, or the employment of a well-qualified academic geologist, perhaps bearing high honours from his University, to examine and advise as to the development of a new oilfield.

And here we come naturally to the practical training that the petroleum technologist must undergo. A sound theoretical knowledge can never be amiss, but a little actual practical knowledge is of far greater value. In geological studies, the only branch of the subject on which I can claim the right to be heard, a week of field work is worth many months of book work and lectures. It is here that our older Universities, Cambridge, Oxford, Edinburgh, and Glasgow fail, though providing for the student adequate academic courses. It is not enough to study strata indoors and even in the field, the student must be taught to make his own geological maps on a large scale, in any kind of country, if he would be anything more than an amateur.

Similarly, the engineering student must be brought into direct contact with plant and taught to run it himself; and the chemist must become acquainted with petroleum, not only in the laboratory but in the distillery.

Modern training is aiming more and more at the practical side, and even our older Universities are becoming affected by this spirit, as witness the successful engineering school at Cambridge. Yet it may be objected that our older Universities are not adapted to teach practical technology, and that the University degree should be, as it ever has been, an academic distinction, which may or may not be of the slightest use to the possessor in after life.

The various Technical Institutes, it may be said, exist for the would-be practical worker, the Universities, strong in their conservatism, should not seek to compete with them.

It has been left for a young University to take the lead and to show how it is possible to combine, with the name of a University

and the distinction of a University degree, a completely practical training. We are all, in a sense, pioneers in this Institution, and we are fortunate to have on our Council a pioneer, in Professor Cadman, who is responsible for the course at Birmingham University for B.Sc. in petroleum, a course that has not only received the active and cordial support of our President, but has been enthusiastically welcomed by everyone in this country who has a practical knowledge of oilfield work. In this course, the student is made familiar with the special geological work necessary in oilfields, with the chemistry of petroleum, and with actual drilling, so that, in whichever branch he decides to specialise later, he will at least have a practical acquaintance with the others.

We look to the Petroleum Course at Birmingham to feed this Institution by maintaining a supply of young and energetic technologists, who will be qualified, after a few years' experience in oilfields, to take positions as managers and field superintendents. It is hoped also that other Universities will follow the lead of Birmingham, and that practical training, not as opposed, but as supplementary to academic training, may play a greater part in the curricula of our older *almae matres*.

Already there are signs that a partial awakening is taking place, and it should not be many years before it will be as unnecessary to depend upon foreigners to manage and develop the Empire's oilfields, as to import foreign engineers to manage this country's railways.

For this desirable result it is only necessary that the subject of petroleum should be better known in all its branches, and that specific technical teaching should be available, that there should be no mystery surrounding the work of the petroleum technologist, but that he should take his place with the British engineer who has done so much for the country's prestige all over the world.

In favouring and controlling this new development, The Institution of Petroleum Technologists will find one of its most important fields of labour, and will confer a benefit, not to be measured in pecuniary advantage, upon the industrial life of Great Britain.

Petroleum Technology as a Profession.

By Professor VIVIAN B. LEWES, F.C.S., F.I.C., *Member.*

FIFTY-FIVE years have now elapsed since Drake bored his first well for petroleum in the Alleghany valley, and the early history of the exploitation of what has now become one of the world's most important industries—the discovery and wresting from Nature of her stores of liquid energy and the fitting it for its many uses in the service of man—shows but little variation from the inception of most of the great achievements of modern times. It is a history of dearly-bought experience, of indomitable energy in overcoming unexpected difficulties as they have arisen, and of woeful waste in doing so. Slowly but surely the knowledge has been bought, data have been accumulated, and Petroleum Technology is now ready to take its place amongst the professions in which science rather than chance rules and results; and the "*raison d'être*" of this Institution is to place it on a plane commensurate with its importance, to give opportunity for the exchange of knowledge and new ideas, to provide in England a body of men, membership of which shall be a hall-mark of ability and integrity in their profession, and to create a national centre which shall be fitted to take its place with the Societies inaugurated in other countries for a kindred purpose.

Until 1912 the student desiring education in this country that would fit him to take up oil prospecting, mining or refining had to content himself with such knowledge as he could collect from the literature of the subject, and had to specialise by work at the oilfields; but in that year the University of Birmingham initiated courses with the special object of training students desirous of adopting the technology of petroleum as a profession, and my desire in this short paper is to emphasise the importance and scope of the career so opened, which the congestion in other professions renders doubly welcome, and which, moreover, if pursued on the true lines, will provide this Institution with the new blood and energy which it will need continuously.

In doing this I wish to emphasise the facts that have been borne in upon me with irresistible force during forty years of teaching the more technical side of science, the first of which is the fatal result of choosing a profession until you are sure that ability and inclination fit you to take it up; and secondly the error of supposing that any branch of science can be specialised

successfully without a sound general knowledge of the basis on which all science rests: it cannot be insisted on too strongly that the technical side of science is merely its adaptation to our special needs, and without a knowledge of the facts and laws that govern the results we desire to attain, mere technical knowledge is so limited as to be practically useless.

Specialisation should never be what it so frequently is—a narrowing of knowledge into special channels: breadth of view must always be maintained, and general knowledge of the whole subject is essential to success. One of the charms of Petroleum Technology as a profession is to be found in the breadth of the interests to which it appeals: the geologist, the engineer and the chemist alike are needed in its manifold ramifications, and a grounding in all three subjects will show the trend of the student's inclinations and indicate the special lines to be pursued in his professional career. If geology appeals to him most, it is in this direction he should specialise, but engineering and the chemistry of the hydrocarbons must not be neglected, as a clear conception of the engineering difficulties to be overcome and the nature of the oil likely to be obtained are necessary to give full value to his powers of tracing the configuration of likely fields and his knowledge of the geometry of the anticline. In the same way, should either of the other main branches of the profession attract him, the general foundation should be well and firmly laid before the specialisation is attempted, and I am convinced that it is only on such lines as these that complete success is to be secured. Common sense and adaptability will always make a useful man, but it is when sound training is added to these that you get the real master in his profession.

There is no profession in the world, at the present time, that offers the fascination and the prizes that are open to the petroleum technologist. Now and for the next few generations, the demand for the geologist and engineer who have specialised in it will exceed the supply, and the whole world is being searched feverishly for the hidden treasure which before long may become the dominant factor, not only in commerce, but in re-allotting the position of the nations.

At first sight, those who have but a superficial knowledge of the subject may be inclined to think that the chemical side of the profession presents a far more restricted and less promising field than either of the others, but it is in this very direction that there is more work to be done, more to be learned, and perhaps the richest rewards to be gained.

We are merely on the threshold of knowledge with regard to the changes that can be wrought in the constitution of the fractions that we obtain from the crude petroleum, of the condition of the sulphur in some oils that enables it to defy purification by processes that are successful with others, and of a hundred other problems that only lengthy research can elucidate.

As an example, take the fuel question as it exists to-day: high flash point fuel oil has become a necessity to every naval power and must be obtained regardless of expense; at the same time the demand for low flash spirits, as motor fuel, has increased with such enormous rapidity that it has overtaken the supply, and the motor trade is being hampered partly by the price to which petrol has risen and still more by there being no guarantee as to future supply and the price to which it may go, this latter consideration largely preventing the enormous increase in motor-driven vans and lorries that otherwise would take place. The need for lubricating oil has grown *pro rata* with the use of petrol, and whereas the demand for the fractions of the crude oil available as petrol, fuel oil and lubricants has quadrupled in the last eight years, the world's supply of crude oil to yield them has less than doubled in that period, in spite of new fields being opened up in every direction and oilfields having the number and depth of wells enormously increased. The world's supply of crude oil last year amounted to 50 million tons, and the average of the three chief fractions, including with the benzine the cracked spirit made by the large Companies, would approximate to :—

Distillate.		Percentage.
0 — 150°C.	Benzine used for petrol and cleaning	10
150 — 300°C.	Kerosene, used as lamp oil and for oil engines ..	35
Above 300°C.	Solar oil, lubricants and fuel oil	55
		100

Casual observation would lead one to believe that the rivalry between gas lighting by the incandescent mantle, and by electricity, together with the extended use of acetylene and petrol-air gas, had reduced greatly the demand for the kerosene fraction for use in oil lamps, and this has focused the attention of chemists all over the world on the problem of converting portions of the kerosene fraction, and that immediately above it, which amounts to about 8 per cent of the fraction above 300°C, into motor fuel fit for use in cars and commercial vehicles.

In attacking this problem the line most widely adopted has been based on the facts first discovered 40 years ago by Thorpe and Young, that heavy hydrocarbon molecules can be so decomposed by regulated heat as to yield mixtures of other hydrocarbons of lower boiling point, and this process of so-called "cracking," has been utilised under widely varying conditions.

It has been attempted with oil alone, with oil and water, with steam and other media, with catalysts and without, under pressure and in vacuo, and so much success has been achieved that it is possible to convert from 40 to 80 per cent of the heavier fractions into good motor fuel, with residues that would make up for the 8 per cent deducted from the fraction above 300°C.

It is quite conceivable that if the fuel question was the only one to be considered, the world's output of crude oil could be converted in the future entirely into motor fuel for traction, liquid fuel for our navies and lubricants for both, the petrol problem, for the time being, being solved by a trebling of the supply. When, however, we come to examine more closely we are struck by the fact that the amount of kerosene still used is by no means inconsiderable, and that, although our attention has been so riveted on the petrol question, that we have concluded mentally that the 100 million gallons imported into this country last year must have far overshadowed the burning oil, yet in fact the kerosene imported amounted to 157 million gallons, whilst American statistics show an increased exportation of 90 million gallons of lighting oil last year over the exports in 1912, from which we may infer that the oil lamp still holds its own in the world.

It is in bringing science to the aid of the Petroleum Industry in solving such questions as the one I have indicated roughly, that the Petroleum Technologist, who takes up the chemical side of the profession, will find fields as fascinating and as remunerative as his brothers who have adopted field work and engineering, and to help forward all, is the hope and aim of the Institution.

OBITUARY NOTICE.

Just as these pages are being sent to Press, one of the most promising of the younger generation of petroleum geologists has passed away in the person of Leonard Victor Dalton, B.Sc., F.G.S., F.R.G.S., Mem.Soc.Chem.Ind., who was amongst the most energetic of the participants in the earlier stages of the foundation of this Institution, and acted as its Secretary until debarred from further work by the disease which ultimately proved fatal, and which originated in malaria encountered during a prolonged expertise in the oilfields of Venezuela in 1910. He was born in 1887 at Newton Toney, Wiltshire, where his father, the Rev. E. N. Dalton, was then officiating as curate, and early showed marked powers of observation of natural phenomena. The greater part of his school-life was passed at Trent College under the Rev. J. M. Tucker.

A year before leaving this, in 1902, being then 15 years of age, he definitely selected petroleum geology as his life-study, and in the following year accompanied his uncle, Mr. W. H. Dalton, to the petroleum-fields of the East Coast of Sakhalin, and in 1904 to Zante and Burma, becoming professionally associated with Sir Boverton Redwood. In the autumn of 1905, he again went to Burma, but independently, and effected valuable expertises in various parts of the province. Returning in 1906, he proceeded at once to Mexico, where he made a short but effective traverse in Tabasco, Chiapas and Southern Vera Cruz. A few months later he passed with honours in the examination for B.Sc. (London). Subsequently he visited Mexico and Sakhalin for the second time, also Tunis, Newfoundland, New Brunswick, Trinidad, Venezuela and Transcaucasia. In the intervals between these journeys, he contributed largely to the second and third editions of Sir Boverton Redwood's standard treatise, "Petroleum and its Products" (C. Griffin & Co., 1906, 1913), described a number of Burmese fossils in the journal of the Geological Society (1908), and dealt, in the pages of Economic Geology (1909), with the principal European oilfields, including Baku, and the Origin of Petroleum, whilst his "Venezuela" (Unwin, 1912) is a model of completeness, terse perspicuous style and accurate systematic description.

His premature decease (at Deal, June 8, 1914) is a heavy blow to science in general, and to the branches connected with petroleum in particular.

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

MEMORANDUM AND ARTICLES OF ASSOCIATION.

BY-LAWS AND REGULATIONS.

HONORARY MEMBERS.

MEMBERS.

ASSOCIATE MEMBERS.

STUDENTS.

ASSOCIATES.

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

Memorandum

AND

Articles of Association.

Date of Incorporation, 17th April, 1914.

Licence by the Board of Trade,

Pursuant to Section 20 of the Companies (Consolidation) Act, 1908.

WHEREAS it has been proved to the Board of Trade that "THE INSTITUTION OF PETROLEUM TECHNOLOGISTS," which is about to be registered under the Companies Acts, 1908 and 1913, as an Association limited by guarantee, is formed for the purpose of promoting objects of the nature contemplated by the 20th Section of the Companies (Consolidation) Act, 1908, and that it is the intention of the said Association that the income and property of the Association whencesoever derived shall be applied solely towards the promotion of the objects of the Association as set forth in the Memorandum of Association of the said Association, and that no portion thereof shall be paid or transferred, directly or indirectly, by way of dividend or bonus or otherwise howsoever, by way of profit to the Members of the said Association.

NOW, THEREFORE, the Board of Trade, in pursuance of the powers in them vested, and in consideration of the provisions and subject to the conditions contained in the Memorandum of Association of the said Association as subscribed by twelve Members thereof on the eighth day of April, 1914, do by this their licence direct "THE INSTITUTION OF PETROLEUM TECHNOLOGISTS" to be registered with limited liability, without the addition of the word "Limited" to its name.

SIGNED by order of the Board of Trade, this 9th day of April, 1914.

H. A. PAYNE,

Comptroller of the Companies Department, authorised in that behalf by the President of the Board of Trade.

COMPANIES ACTS, 1908 AND 1913.

Memorandum of Association
OF
THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

1. The name of the Association is "THE INSTITUTION OF PETROLEUM TECHNOLOGISTS."

2. The Registered Office of the Association will be situate in England.

3. The objects for which the Institution is established are :—

(A) To enable technologists engaged in the petroleum or shale oil industry to meet and to correspond, and to accumulate trustworthy information regarding the occurrence and production or winning of petroleum and oil shale, the conversion of the raw materials into manufactured products, and the characters and uses of these products, together with their transport and storage :

(B) To promote the better education of persons desirous of becoming professional consulting petroleum technologists, petroleum engineers, geologists or chemists, and to elevate the professional status of those employed in the petroleum industry by setting up a high standard of scientific and practical proficiency, and by insisting upon the observance of strict rules in regard to professional conduct :

(C) To provide or subscribe towards places of instruction and hospitals, dispensaries and other like institutions, either confined to the use of persons who are or have been engaged in the petroleum or shale oil industry or not so confined :

(D) To form, subscribe to or otherwise aid institutions or other organisations not carrying on business for profit connected with the petroleum industry or otherwise having any moral or other claim to support or aid by the Association :

(E) To endow professorships or studentships in any university, college, school or other place of instruction or institution :

(F) To establish and support, or aid in the establishment and support of associations, institutions, funds, trusts and conveniences calculated to benefit employees or ex-employees

of the Association, or the dependents or connections of such persons, and to grant pensions and allowances and to make payments towards insurances, and to subscribe or guarantee money for charitable or benevolent objects, or for any exhibition, or for any public, general or useful object :

(G) The borrowing of any money required for the purposes of the Association upon such securities and on such terms as may from time to time be determined :

(H) To invest and deal with the moneys of the Association not immediately required upon such security and on such terms as may from time to time be determined :

(I) To do all such other lawful things incidental and conducive to the attainment of the above objects or any of them.

Provided that the Association shall not support with its funds any object or endeavour to impose on or procure the observance by its Members or others of any regulations or restrictions which if an object of the Association would make it a trade union.

Provided also that in case the Association shall take or hold any property subject to the jurisdiction of the Board of Education or Charity Commissioners for England and Wales, the Association shall not sell, mortgage, charge or lease the same without such authority, approval or consent as shall be required by law, and as regards any such property, the Council or other the Managers, or Trustees of the Association shall be chargeable for such property as may come into their hands, and shall be answerable and accountable for their own acts, receipts, neglects and defaults, and for the due administration of such property in the same manner and to the same extent as they would as such Council, Managers or Trustees have been if no incorporation had been effected, and the incorporation of the Association shall not diminish or impair any control or authority exercisable by the Chancery Division or the Board of Education or Charity Commissioners over such Council, Managers or Trustees, but they shall, as regards any such property, be subject jointly and separately to such control or authority as if the Association were not incorporated. In case the Association shall take or hold any property which may be subject to any trusts, the Association shall only deal with the same in such manner as allowed by law, having regard to such trusts.

4. The income and property of the Association, from whatever source derived, shall be applied solely towards the promotion of the objects of the Association as set forth in this Memorandum of Association, and no portion thereof shall be paid or transferred

directly or indirectly by way of dividend, bonus or otherwise howsoever by way of profit to the persons who at any time are or have been Members of the Association, or to any of them, or to any person claiming through any of them; provided that nothing herein contained shall prevent the payment in good faith of reasonable and proper remuneration to any officers or servants of the Association, or to any Member of the Association, in return for any services actually rendered to the Association, or prevent the giving of privileges to the Members of the Association in attending the meetings and enjoying the benefit of the buildings and other conveniences of the Association, or prevent the borrowing of money (under such powers as the Association and the Council thereof may possess) from any Member of the Association, at a rate of interest not greater than five per cent. per annum, but so that no Member of the Council of Management or Governing Body of the Association shall be appointed to any salaried office of the Association or any office of the Association paid by fees, and that no remuneration or other benefit in money or money's worth shall be given to any Member of such Council or Governing Body except repayment of out-of-pocket expenses and interest at the rate aforesaid on money lent or reasonable and proper rent for any premises demised to the Association: Provided that this provision shall not apply to any payment to any railway, gas, electric lighting, water or cable company of which a Member of the Council of Management or Governing Body may be a member, or any other company in which such Member shall not hold more than one-hundredth part of the capital, and such Member shall not be bound to account for any share of profits he may receive in respect of such payment.

5. No addition, alteration, or amendment shall be made to or in the regulations contained in the Articles of Association for the time being in force unless the same shall have been previously submitted to and approved by the Board of Trade.

6. The fourth and fifth paragraphs of this Memorandum contain conditions upon which a licence is granted by the Board of Trade to the Association in pursuance of Section 20 of the Companies (Consolidation) Act, 1908.

7. The liability of the Members is limited.

8. Every Member of the Association undertakes to contribute to the assets of the Association in the event of the same being wound up during the time that he is a Member, or within one year afterwards, for payment of the debts and liabilities of the Associa-

tion contracted before the time at which he ceases to be a Member, and of the costs, charges and expenses for winding up the same, and for the adjustment of the rights of the contributories among themselves, such amount as may be required not exceeding one pound.

9. If upon the winding up or dissolution of the Association there remains, after the satisfaction of all its debts and liabilities, any property whatsoever, the same shall not be paid to or distributed among the Members of the Association, but if and so far as effect can be given to the next provision, shall be given or transferred to some other institution or institutions having objects similar to the objects of the Association, which shall prohibit the distribution of its or their income and property amongst its or their members to an extent at least as great as is imposed on the Association under or by virtue of Clause 4 hereof, such institution or institutions to be determined by the Members of the Association at or before the time of dissolution, or, in default thereof, by such Judge of the High Court of Justice as may have or acquire jurisdiction in the matter.

10. True accounts shall be kept of the sums of money received and expended by the Association and the matters in respect of which such receipt and expenditure take place, and of the property, credits and liabilities of the Association, and subject to any reasonable restrictions as to the time and manner of inspecting the same that may be imposed in accordance with the regulations of the Association for the time being, shall be open to the inspection of the Members. Once at least in every year the accounts of the Association shall be examined, and the correctness of the balance-sheet ascertained by one or more properly qualified Auditor or Auditors.

WE, the several persons whose names and addresses are subscribed, are desirous of being formed into an Association in pursuance of this Memorandum of Association.

NAMES, ADDRESSES, AND DESCRIPTIONS OF SUBSCRIBERS.

C. GREENWAY, Merchant, Winchester House, 50, Old Broad Street, E.C.

BOVERTON REDWOOD, Adviser on Petroleum, 4, Bishopsgate, E.C.

ROBERT REDWOOD, Anal. Chemist, 4, Bishopsgate, E.C.

COWDRAY (BARON), 47, Parliament Street, Westminster, S.W.

EDWIN RICHARDSON BLUNDSTONE, 79, York Street, Westminster, Petroleum Expert.

A. COOPER-KEY, Major, H.M. Chief Inspr. of Explosives, Home Office, S.W.

E. H. CUNNINGHAM CRAIG, Consulting Geologist, Abbey Buildings, Princes St., Westminster.

ALFRED C. ADAMS, 101, Leadenhall St., E.C., Managing Director of a Public Company.

VIVIAN B. LEWES, Royal Naval College, Greenwich, S.E., Professor of Chemistry.

T. C. PALMER, Engineering Works, Dagenham, Essex, Engineer.

JOHN T. CARGILL, 175, West George Street, Glasgow, Merchant.

ROBERT BALFOUR, 7, Gracechurch Street, London, E.C., Merchant

Dated this 8th day of April, 1914.

Witness to all the above Signatures—

H. W. BROWN,
Clerk to Messrs. ASHURST, MORRIS, CRISP & Co.,
17, Throgmorton Avenue, E.C.,
Solrs.

COMPANIES ACTS, 1908 AND 1913.

Articles of Association

OF

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

INTRODUCTION.

WHEREAS an Association called "The Institution of Petroleum Technologists" has been formed for the objects expressed in the Memorandum of Association of the Association (hereinafter called "the Institution") under the Companies Acts, 1908 and 1913:

AND WHEREAS terms used in these Articles are intended to have the same respective meanings as they have when used in those Acts, and words implying the singular number are intended to include the plural number and *vice versâ*:

NOW THEREFORE IT IS HEREBY AGREED as follows:—

The regulations contained in Table "A" of the First Schedule to the Companies (Consolidation) Act, 1908, shall not apply to this Company, but the following shall be the regulations of the Company.

CONSTITUTION.

1. The Institution shall consist of Members, Associate Members, Students, Associates, and Honorary Members having the respective rights hereinafter expressed, but all of whom shall be Members of the Institution for the purposes of Clause 8 of the Memorandum of Association.

2. For the purposes of registration the total number of Members in all classes is declared not to exceed 500, but the Council hereinafter mentioned may when necessary register an increase.

3. The first Members of the Institution shall be such of the following persons as shall consent in writing to become Members:—

A. C. Adams,
Herbert Allen,
J. T. Armstrong,
Sir Robert Balfour, Bart.,
Dr. George T. Beilby,
E. R. Blundstone,
Sir Thomas B. Bowring,
Professor John Cadman,
J. T. Cargill,
Lord Cowdray of Midhurst,

E. H. Cunningham Craig,
W. Bruce Dick,
Arthur W. Eastlake,
C. Greenway,
J. Hamilton,
John Hay,
Dr. J. A. L. Henderson,
Sir Thomas Holland,
F. Lane,
Prof. Vivian B. Lewes,
W. H. MacGarvey,
A. Milne,
T. C. Palmer,
Sir Boverton Redwood, Bart.,
Robert Redwood,
H. W. Sillem,
W. Smellie,
George Tweedy,
C. W. Wallace,

who shall be known as Founder Members, and shall enjoy such privileges as are prescribed by the by-laws from time to time in force.

4. Any person may become a Member of the Institution who shall be qualified and elected as hereinafter mentioned, and shall agree in writing to become such Member, and shall pay the entrance fee and first subscription.

5. Those Members who have agreed to become such prior to the first meeting of the Institution (not being Founder Members) shall be known as Original Members, and entitled to such privileges as shall be prescribed by the by-laws from time to time in force.

6. The qualifications, mode of election, rights and privileges of Members, Associate Members, Students, Associates, and Honorary Members shall (save as herein provided) be prescribed by the by-laws from time to time in force.

7. The rights and privileges of every Member, Associate Member, Student, Associate, or Honorary Member shall be personal to himself, and shall not be transferable or transmissible by his own act or by operation of law.

ENTRANCE FEES AND SUBSCRIPTIONS.

8. The entrance fees and subscriptions of Members, Associate Members, Students, and Associates shall be prescribed by the by-laws from time to time in force.

EXPULSION.

9. If any Member, Associate Member, Student or Associate shall leave his subscription in arrears for two years, and shall fail to pay such arrears within three months after a written application has been sent him by the Secretary, his name may be struck off the register by the Council at any time afterwards, and he shall

thereupon cease to have any rights as a Member, Associate Member, Student or Associate, but he shall nevertheless continue liable to pay the arrears of subscription due at the time of his name being so struck off: Provided always that this Article shall not be construed to compel the Council to remove any name if they shall be satisfied the same ought to be retained.

10. The Council may refuse to continue to receive the subscriptions of any person who shall have wilfully acted in contravention of the regulations of the Institution, or who shall in the opinion of the Council have been guilty of such conduct as shall have rendered him unfit to continue to belong to the Institution; and may remove his name from the register, and he shall thereupon cease to be a Member, Associate Member, Student or Associate (as the case may be) of the Institution, provided that before his name shall be so removed he shall be entitled to an opportunity of appearing before the Council and being heard in his defence.

11. The first General Meeting shall be held at such time, not being more than three or less than one month after the incorporation of the Institution, and place as shall be prescribed by the Council.

GENERAL MEETINGS.

12. The General Meetings shall consist of the Ordinary Meetings, the Annual General Meeting, and of Special Meetings as hereinafter defined.

13. The Annual General Meeting shall take place in London in one of the first three months of every year. The Ordinary Meetings shall take place at such times and places as the Council shall determine.

14. At the Annual General Meeting the Council shall submit a report on the affairs of the Institution for the past year, together with a statement of account for such year signed by the Auditor or Auditors, and the appointment of Auditor or Auditors shall then take place.

15. A Special Meeting may be convened at any time by the Council, and shall be convened by them whenever a requisition signed by 20 Members or Associate Members of the Institution specifying the object of the meeting is left with the Secretary. If for 14 days after the delivery of such requisition a meeting be not convened in accordance therewith, the requisitionists or any 20

Members or Associate Members of the Institution may convene a Special Meeting in accordance with the requisition. All Special Meetings shall be held in London.

16. Seven clear days' notice of every meeting, specifying generally the nature of any special business to be transacted at any meeting, shall be given to every person on the register of the Institution, except as provided by Article 37, and no other special business shall be transacted at such meeting, but the non-receipt of such notice shall not invalidate the proceedings of such meeting. No notice of the business to be transacted (other than such ballot lists as may be requisite in case of elections) shall be required in the absence of special business.

17. Special business shall include all business for transaction at a Special Meeting and all business for transaction at any other meeting, with the exception of the reading and confirmation of the minutes of the previous meeting, the election of Members or Associate Members, Students and Associates, and the reading and discussion of communications as prescribed by the by-laws or by any regulation of the Council made in accordance with the by-laws.

PROCEEDINGS AT GENERAL MEETINGS.

18. Ten Members or Associate Members shall constitute a quorum for the purpose of a meeting other than a Special Meeting. Twenty Members or Associate Members shall constitute a quorum for the purpose of a Special Meeting.

19. If within 15 minutes after the time fixed for holding the meeting a quorum is not present, the meeting shall be dissolved, and all matters which might if a quorum had been present have been done at a meeting (other than a Special Meeting) so dissolved may forthwith be done on behalf of the meeting by the Council.

20. The President shall be Chairman at every meeting, and in his absence the Vice-President, and in the absence of the Vice-President a Member of Council shall take the Chair, and if no Member of Council be present and willing to take the chair, the meeting shall elect a Chairman from the Members or Associate Members present.

21. The decision of a General Meeting shall be determined by a show of hands, unless after the show of hands a poll is forthwith demanded, and by a poll when a poll is thus demanded. The manner of taking a show of hands or a poll shall be in the discretion

of the Chairman, and an entry in the minutes signed by the Chairman shall be sufficient evidence of the decision of the General Meeting. Each Member and Associate Member shall have one vote and no more. In case of equality of votes the Chairman shall have a second or casting vote, provided that this Article shall not interfere with the provisions of any by-laws as to election by ballot.

22. The acceptance or rejection of votes by the Chairman shall be conclusive for the purpose of the decision of the matter in respect of which the votes are tendered, provided that the Chairman may review his decision at the same meeting, if any error be then pointed out to him.

BY-LAWS.

23. The Council may make by-laws to regulate all matters by the Articles left to be prescribed by the by-laws, and all matters which consistently with the Articles may be made the subject of by-laws, and do not amount to such an alteration or addition to the Articles as could only legally be made by a special resolution and with the approval of the Board of Trade. Alterations in and additions to the first by-laws so made by the Council may be made only by resolution of the Members and Associate Members at an Annual General Meeting after notice of the proposed alteration or addition has been announced at the previous Ordinary Meeting, and not otherwise.

COUNCIL.

24. The Council of the Institution shall be chosen from the Members only, and shall consist of one President, one or more Vice-Presidents, ten or more ordinary Members of Council, and of Past-Presidents, who are still Members of the Institution. The President, Vice-President or Vice-Presidents, and four Members of Council (other than Past-Presidents) shall retire at each Annual General Meeting, but shall be eligible for re-election. The Vice-President or Vice-Presidents and Members of Council to retire in each year shall, unless the Council agree otherwise among themselves, be chosen from those who have been longest in office, and in cases of equal seniority shall be determined by ballot.

25. The election of a President, Vice-President or Vice-Presidents, and Members of Council to supply the place of those

retiring at the Annual General Meeting shall be conducted in such manner as shall be prescribed by the by-laws from time to time in force.

26. The Council may supply any casual vacancy in the Council (including any casual vacancy in the office of President) which shall occur between one Annual General Meeting and another, and the President, Vice-President or Vice-Presidents, or Members of Council so appointed by the Council shall retire at the succeeding Annual General Meeting. Vacancies not fil'ed up at any such meeting shall be deemed to be casual vacancies within the meaning of this Article.

OFFICERS.

27. The officers and servants of the Institution shall be appointed and removed in the manner prescribed by the by-laws from time to time in force.

28. The powers and duties of the officers of the Institution shall, subject to any express provisions in the Articles or by-laws, be determined by the Council.

POWERS AND PROCEDURE OF COUNCIL.

29. The Council may regulate their own procedure, and delegate any of their powers and discretions to any one or more of their body, and may determine their own quorum. If no other number is prescribed, three Members of Council shall form a quorum.

30. The Council shall manage the property, proceedings and affairs of the Institution in accordance with the by-laws from time to time in force.

31. The Treasurer may, with the consent of the Council, invest in the name of the Institution any moneys not immediately required for the purposes of the Institution in or upon any of the following investments (that is to say) :—

(A) The Public Funds or Government Stocks of the United Kingdom, or of any Foreign or Colonial Government guaranteed by the Government of the United Kingdom :

(B) Real or leasehold securities, or in the purchase of real or leasehold properties in Great Britain or Ireland :

(C) Debentures, Debenture Stock, or Guaranteed or Preference Stock of any company incorporated by Special Act of

Parliament, the ordinary shareholders whereof shall at the time of such investment be in actual receipt of half-yearly or yearly dividends :

(D) Stocks, Shares, Debentures, or Debenture Stock of any Railway, Canal or other Company, the undertaking whereof is leased to any Railway Company at a fixed or fixed minimum rent :

(E) Stocks, Shares or Debentures of any East Indian Railway or other Company which shall receive a contribution from His Majesty's East Indian Government of a fixed annual percentage on their capital, or be guaranteed a fixed annual dividend by the same Government :

(F) The security of rates levied by a corporate body empowered to borrow money on the security of rates, where such borrowing has been duly authorised by Act of Parliament.

32. The Council may, with the authority of a resolution of the Members and Associate Members in General Meeting, borrow moneys for the purposes of the Institution on the security of the property of the Institution, or otherwise at their discretion.

ACCOUNTS AND AUDIT.

33. All accounts and books of account of the Institution shall be kept at the registered office, and, subject to any reasonable restrictions as to the time and manner of inspecting the same that may be imposed by the Institution in General Meeting, the same shall be open to the inspection of the Members of all classes at all times during the usual business hours.

34. The provisions of Sections 112 and 113 of the Companies (Consolidation) Act, 1908, shall apply to and be observed by the Institution, the first General Meeting being treated as the Statutory Meeting, the Council being treated as the Directors, and the Members of all classes being treated as the shareholders mentioned in the said sections.

NOTICES.

35. A notice may be served by the Council upon any Member, Associate Member, Student, Associate or Honorary Member, either personally or by sending it through the post in a prepaid letter addressed to him at his registered place of abode.

36. Any notice, if served by post, shall be deemed to have been

served at the time when the letter containing the same would be delivered in the ordinary course of the post, and in proving such service it shall be sufficient to prove that the letter containing the notice was properly addressed and put into the post office.

37. No Member, Associate Member, Student, Associate, or Honorary Member, not having a registered address within the United Kingdom, shall be entitled to any notice, and all proceedings may be had and taken without notice to such Member in the same manner as if he had had due notice.

NAMES, ADDRESSES, AND DESCRIPTIONS OF SUBSCRIBERS.

C. GREENWAY, Merchant, Winchester House, 50, Old Broad Street, E.C.

BOVERTON REDWOOD, Adviser on Petroleum, 4, Bishopsgate, E.C.

ROBERT REDWOOD, Anal. Chemist, 4, Bishopsgate, E.C.

COWDRAY (BARON), 47, Parliament Street, Westminster, S.W.

EDWIN RICHARDSON BLUNDSTONE, 79, York Street, Westminster, Petroleum Expert.

A. COOPER-KEY, Major, H.M. Chief Inspr. of Explosives, Home Office, S.W.

E. H. CUNNINGHAM CRAIG, Consulting Geologist, Abbey Buildings, Princes St., Westminster.

ALFRED C. ADAMS, 101, Leadenhall St., E.C., Managing Director of a Public Company.

VIVIAN B. LEWES, Royal Naval College, Greenwich, S.E., Professor of Chemistry.

T. C. PALMER, Engineering Works, Dagenham, Essex, Engineer.

JOHN T. CARGILL, 175, West George Street, Glasgow, Merchant.

ROBERT BALFOUR, 7, Gracechurch Street, London, E.C., Merchant.

Dated this 8th day of April, 1914.

Witness to all the above Signatures—

H. W. BROWN,
Clerk to Messrs. ASHURST, MORRIS, CRISP & Co.,
17, Throgmorton Avenue, E.C.,
Solrs.

No. 135273. [COPY.]

Certificate of Incorporation.

I HEREBY CERTIFY, THAT THE INSTITUTION OF PETROLEUM TECHNOLOGISTS (the word "Limited" being omitted by Licence of the Board of Trade) is this day Incorporated under the Companies Acts, 1908 and 1913, and that the Company is Limited.

Given under my hand at London this Seventeenth day of April, One Thousand Nine Hundred and Fourteen.

Fees and Deed Stamps £8 10*s.* 0*d.*

Stamp Duty on Capital £,——.

GEO. J. SARGENT,

Assistant Registrar of Joint Stock Companies.

No. 135273. [COPY.]

Certificate

under s. 87 (2) *of the Companies (Consolidation) Act*, 1908 (8 *Edw.* 7, *c.* 69), *that a Company is entitled to commence business.*

I HEREBY CERTIFY, THAT THE INSTITUTION OF PETROLEUM TECHNOLOGISTS (the word "Limited" being omitted by Licence of the Board of Trade) which was incorporated under the Companies Acts, 1908 and 1913, on the Seventeenth day of April, 1914, and which has this day filed a statutory declaration in the prescribed form that the conditions of s. 87—1 (*a*) and (*b*) of the Companies (Consolidation) Act, 1908, have been complied with, is entitled to commence business.

Given under my hand at London this Twenty-fifth day of May, One Thousand Nine Hundred and Fourteen.

GEO. J. SARGENT,

Assistant Registrar of Joint Stock Companies.

BY-LAWS AND REGULATIONS

OF

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

SECTION I.

Objects.

The objects for which The Institution of Petroleum Technologists was established, are :—

(*a*) To enable technologists engaged in the petroleum or shale-oil industry to meet and to correspond, and to accumulate trustworthy information regarding the occurrence and production or winning of petroleum and oil shale, the conversion of the raw materials into manufactured products, and the characters and usages of these products, together with their transport and storage.

(*b*) To promote the better education of persons desirous of becoming professional consulting technologists, petroleum engineers, geologists, or chemists, and to elevate the professional status of those employed in the petroleum industry by setting up a high standard of scientific and practical proficiency, and by insisting upon the observance of strict rules in regard to professional conduct.

SECTION II.

Definitions.

1. The word petroleum is accepted in the widest sense and includes all natural bitumens (and derivative hydrocarbon products) from the lightest gaseous state as represented by natural-gas, through the varying densities of liquid petroleum, to the various solid forms ; in addition to which is included the legal definition by the Petroleum Act, 1871 (34 and 35 Vict., ch. 105), whereby petroleum is defined in the following words :—" For the purposes of this Act the term ' petroleum ' includes any rock oil, Rangoon oil, Burmah oil, oil made from petroleum, coal, schist, shale, peat, or other bituminous substance, and any products of petroleum, or any of the above-mentioned oils."

2. Petroleum technology implies the application of the knowledge of geology, chemistry, and engineering to the exploration for petroleum or the exploitation of petroleum and its products; and more particularly to the occurrence and production or winning of petroleum or oil shale, the conversion of the raw materials into manufactured products, and the characters and usages of these products, together with their transport and storage.

SECTION III.

Constitution.

1. The Institution of Petroleum Technologists shall consist of Members, of Associate Members, of Students, of Associates, and of Honorary Members.

2. The first twenty-nine Members of the Institution shall be known as Founder Members, while Members of all classes who have agreed to become such prior to the first meeting of the Institution (not being Founder Members) shall be known as Original Members.

3. Members shall comprise every person who, on the 17th day of June, 1914, was on the register as a Member and every person thereafter elected or transferred into the class of Members. Every candidate for admission into the class of Members or for transfer into that class shall be not less than 30 years of age, and shall satisfy the Council (*a*) that he has received a good general and scientific education and has been for at least five years in a responsible position with regard to petroleum technology and is so engaged at the time of his application; and he shall be in the opinion of the Council, a fit and proper person to belong to the Institution.

(*Note.*—The definition of the term "responsible position" is, that of a person in full charge of important petroleum technological operations; or in practice as a consulting petroleum technologist whose training and experience can be shown reasonably to justify such professional position.)

Or (*b*) he shall be, in the opinion of the Council, by reason of his position or attainments, a desirable person to become a Member.

4. Associate Members shall comprise every person who, on the 17th day of June, 1914, was on the register as an Associate Member; and every person thereafter elected or transferred into the class of Associate Members. Every candidate for admission

into the class of Associate Members or for transfer into that class, shall be not less than 25 years of age, and shall satisfy the Council that he has received a good general and scientific education, and has had at least two years practical experience in a position as petroleum technologist, of a character recognised as leading up to qualification for Membership, and he shall be so engaged at the time of his application; and he shall be, in the opinion of the Council, a fit and proper person to belong to the Institution.

5. Students shall comprise every person who, on the 17th day of June, 1914, was on the register as a Student and every person thereafter elected into the class of Students. Every candidate for admission as a Student shall be not less than 18 years of age and shall satisfy the Council that (*a*) he has received a good general education and (*b*) that he is or has been a pupil of a Member of the Institution engaged in petroleum technology; or that not being a pupil, he is intending to qualify himself for the profession of a petroleum technologist.

6. Associates shall comprise every person who, on the 17th day of June, 1914, was on the register as an Associate and every person thereafter elected into the class of Associates. Every candidate for admission into the class of Associates shall be not less than 30 years of age, and shall be a person who, not being eligible for Membership or Associate Membership, yet by reason of his practical experience in any of the branches of petroleum technology or otherwise, is, in the opinion of the Council, a fit and proper person to belong to the Institution.

7. The Council shall have the power to nominate as Honorary Life Members persons of eminence or scientific attainments, who may not be actively engaged in the practice of the profession of petroleum technology.

8. At the discretion of the Council every properly qualified Associate Member may on application be transferred to the class of Members, and every properly qualified Student may on application be transferred to the class of Associate Members or Members.

9. Any Member, Associate Member, Student, Associate or Honorary Member having occasion to designate himself as belonging to the Institution shall state the class to which he belongs, according to the following abbreviated forms, viz.: M.Inst.P.T., A.M.Inst. P.T., Stud.Inst.P.T., Assoc.Inst.P.T., Hon.M.Inst.P.T.

SECTION IV.

Election, Transference and Expulsion of Members, Associate Members, Students and Associates.

1. A candidate for admission into the Institution as a Member, Associate Member or Associate, shall be proposed in accordance with Form A in the *Appendix*, and his proposal must be signed by not less than four Members or Associate Members of whom the proposer and seconder must have personal knowledge of the candidate.

2. A candidate for admission into the Institution as a Student, shall be proposed in accordance with Form A in the *Appendix*, and his proposal must be signed by the Principal or Professor of his College, or by two Members or Associate Members of the Institution.

3. A candidate for transference into the class of Associate Members or Members, shall be proposed in accordance with Form B in the *Appendix*, and his proposal must be signed by not less than four Members or Associate Members of whom the proposer and seconder must have personal knowledge of the candidate.

4. Every Student of the Institution who has not within a period of eight years applied for and obtained transfer to a higher class, shall be removed from the roll of membership.

5. The proposal form, when duly filled up, must be forwarded to the Secretary of the Institution, who shall lay it before the Council at their next meeting.

6. The Council shall determine whether the qualifications of the candidate are in accordance with the By-Laws of the Institution, and if so, may approve the nomination of the candidate to the class for which he is eligible, and the inclusion of his name on the next ballot-list.

7. The method of voting for election of Members, Associate Members, Students or Associates, shall be by ballot of the Members and Associate Members only.

8. Each ballot-list shall be classified, and shall specify the name, occupation and address of each candidate, and the names of his proposer and seconder, and shall be signed by the Chairman of the Council Meeting at which it was authorized, and a copy

of such list shall be forwarded to each Member and Associate Member having a registered address in the United Kindgom.

9. Should any Member or Associate Member disapprove of any name or names contained in the ballot-list, he shall draw a line across the name or names, but otherwise make no mark thereon.

10. The ballot-lists shall be delivered sealed to the Secretary not later than the time at which the ballot shall be declared closed.

11. The ballot-lists shall be opened by or in the presence of a Committee appointed for that purpose, and the Committee shall report the result of the ballot to the Council.

12. When four-fifths or more of the votes given shall be in favour of the candidate, such candidate shall be elected; but when a smaller proportion than four-fifths of the votes given shall be in favour of the candidate, he shall not be elected.

13. No such ballot is valid unless 11 or more Members or Associate Members ballot.

14. When a candidate has been elected the Secretary shall give him notice thereof (according to Form C in the *Appendix*) but his name shall not be added to the Register of the Institution until he has paid his Entrance Fee, if any, and first Annual Subscription, and unless he pays the fees due within one calendar month from the day of his election, or within such further time as the Council may grant upon special cause being shown, the election shall be void.

15. When a candidate has been transferred to a higher class of membership the Secretary shall give him notice thereof (according to Form C in the *Appendix*), but his name shall not be added to such higher class until he has paid his Entrance Fee or additional Entrance Fee, and his additional Subscription.

16. In case of non-election no mention shall be made thereof in the Minutes, and no official notice shall be given to the unsuccessful candidate.

17. The result of each ballot shall be declared at the next following General Meeting.

18. If any Member, Associate Member, Student or Associate shall leave his subscription in arrears for two years and shall fail to pay such arrears within three calendar months after a written application (according to Form D in the *Appendix*) has been sent to him by the Secretary, his name may be struck off the Register

by the Council at any time afterwards, and he shall thereupon cease to have any rights as a Member, Associate Member, Student or Associate, but he shall nevertheless continue liable to pay the arrears of subscriptions due at the time of his name being so struck off, and the Secretary shall give him notice according to Form E in the *Appendix*: Provided always that this regulation shall not be construed to compel the Council to remove any name, if they shall be satisfied the same ought to be retained: Provided also that the Council may at their discretion reduce or remit the subscription or the arrears of the subscription of any Member, Associate Member, Student or Associate who shall have become temporarily unable to continue the subscription due from him.

19. The Council may, by a majority of four-fifths of those present at a meeting of the Council specially called for the purpose, and at which at least ten members of the Council are present, refuse to continue to receive the subscriptions of any person who shall have wilfully acted in contravention of the regulations of the Institution, or who shall in the opinion of the Council have been guilty of such conduct as shall have rendered him unfit to continue to belong to the Institution; and may remove his name from the Register, and he shall thereupon cease to be a Member, Associate Member, Student or Associate (as the case may be) of the Institution; and the Secretary shall give him notice according to Form F in the *Appendix*: Provided that before his name shall be so removed he shall be entitled to an opportunity of appearing before the Council and being heard in his defence.

SECTION V.

Professional Conduct.

Every Member and Associate Member of the Institution shall observe and be bound by the following Regulations:—

1. He shall act in all professional matters strictly in a fiduciary manner with regard to any Clients whom he may advise and his charges to such Clients shall constitute his only remuneration in connection with such work, except as provided by Clause 4.

2. He shall not accept any trade commissions, discounts, allowances, or any indirect profit in connection with any work which he is engaged to design or to superintend, or with any professional business which may be entrusted to him.

3. He shall not, while acting in a professional capacity, be

at the same time, without disclosing the fact in writing to his Clients, a Director or Member of, or a Shareholder in, or act as Agent for, any contracting or manufacturing company or firm or business with which he may have occasion to deal on behalf of his Clients, or have any financial interest in such a business.

4. He shall not receive, directly or indirectly, any Royalty, Gratuity, or Commission, on any patented or protected article or process used on work which he is carrying out for his Clients, unless and until such Royalty, Gratuity or Commission has been authorised in writing by those Clients.

5. He shall not improperly solicit professional work, either directly or by an agent, nor shall he pay, by commission or otherwise, any person who may introduce Clients to him.

6. He shall not be the medium of payments made on his Client's behalf to any Contractor, or business firm (unless specially so requested by his Clients), but shall only issue certificates or recommendations for payment by his Clients.

Any alleged breach of these regulations or any alleged professional misconduct by a Member or Associate Member, which may be brought before the Council, properly vouched for and supported by sufficient evidence, shall be investigated, and if proved, shall be dealt with by the Council, either by expulsion of the offender from the Institution or in such other manner as the Council may think fit.

SECTION VI.

Contribution to the Funds.

1. An Entrance Fee shall not be paid by Founder Members, Original Members or Students.

2. The Entrance Fee for a Member shall be Two Guineas (2*l.* 2*s.* 0*d.*); for an Associate Member or Associate One Guinea (1*l.* 1*s.* 0*d.*); but each Associate Member, on being transferred to Membership, shall pay an additional Entrance Fee of One Guinea (1*l.* 1*s.* 0*d.*).

3. Each Student on being transferred to a higher class, shall pay the Entrance Fee for such class.

4. Each Member shall pay an Annual Subscription of Three Guineas (3*l.* 3*s.* 0*d.*), and each Associate Member, on transfer to Membership, shall pay an additional sum of Half-a-Guinea

(10*s*. 6*d*.) if his Subscription as Associate Member has already been paid in respect of the year in which he is transferred; and each Student, on transfer to Membership, shall pay an additional sum of Two Guineas (2*l*. 2*s*. 0*d*.) if his Subscription as Student has already been paid in respect of the year in which he is transferred.

5. Each Associate Member shall pay an Annual Subscription of Two Guineas and a-Half (2*l*. 12*s*. 6*d*.); and each Student on transfer to Associate Membership, shall pay an additional sum of One Guinea and a-Half (1*l*. 11*s*. 6*d*.) if his Subscription as Student has already been paid in respect of the year in which he is transferred.

6. Each Student shall pay an Annual Subscription of One Guinea (1*l*. 1*s*. 0*d*.).

7. Each Associate shall pay an Annual Subscription of Two Guineas (2*l*. 2*s*. 0*d*.).

8. All Subscriptions shall be payable in advance, and shall become due on the first day of January of each year; and the first Subscription of each Member, Associate Member, Student or Associate, shall date from the first day of January in the year of his election, and shall, except in the cases provided for in Clause 9, entitle him to the Proceedings published during that year.

9. In the case of each Member, Associate Member, Student or Associate, elected in the last three months of any year, the first Subscription shall cover both the year of election and the succeeding year, but shall entitle the person only to the Proceedings published after his election.

10. Any Founder Member, whose Subscription is not in arrear, may at any time compound for his Subscription for the current and all future years by the payment of Twenty-five Pounds. The payment of such composition fee shall be deemed to release him from any guarantee given by him prior to the formation of the Institution.

11. Any Original Member of all classes (including Original Students on attaining a higher class of Membership) whose Subscription is not in arrear may compound for the current and all future years by the payment of Thirty Guineas (31*l*. 10*s*. 0*d*.).

12. Any Member, Associate Member or Associate (other than Founder and Original Members) whose Subscription is not in arrear, may compound for the current and all future years by

the payment of Forty-five Guineas (47*l.* 5*s.* 0*d.*), exclusive of Entrance Fee on admission or transference to a higher class.

13. The Composition Fee for any Member, Associate Member or Associate, coming within Clauses 11 and 12 of this Section, who has belonged to the Institution for a period of Five years, and whose Subscription is not in arrear, shall be reduced by One Pound (1*l.* 0*s.* 0*d.*) for each year of membership after the first Five years.

14. All Entrance Fees and all Compounding Fees (which shall not be returnable) shall be regarded as Capital of the Institution and shall be invested as the Council may direct, in conformity with the Articles, the interest alone to be appropriated to current expenditure.

15. All donations paid to the Institution shall be regarded as Capital (with the exceptions of sums given for application to special purposes) and these amounts may be used at the discretion of Council.

16. Every person desirous of bequeathing to the Institution any Sum or Sums of Money, Manuscripts, Books, Maps, Plans, Drawings, Instruments, Specimens or other personal property is requested to make use of the following form in his will:—

> "I give and bequeath to THE INSTITUTION OF PETROLEUM TECHNOLOGISTS (*here enumerate and give particulars of the effects or property to be bequeathed*) and I hereby declare that the receipt of the Treasurer of the Institution for the time being shall be an effectual discharge to my executors for the said legacy or bequest."

SECTION VII.

CONSTITUTION OF THE COUNCIL, MODE OF ELECTION, POWERS AND PROCEDURE OF COUNCIL.

1. The Council of the Institution shall be chosen from the Members only, and shall consist of one President, one or more Vice-Presidents, ten or more ordinary Members of Council and of Past-Presidents, who are still members of the Institution.

2. The President, Vice-President or Vice-Presidents, and four Members of Council (other than Past-Presidents) shall retire at each Annual General Meeting, but shall be eligible for re-election. The four Members of Council to retire in each year shall unless the Council agree otherwise among themselves, be chosen from those who have been longest in office and in case of equal seniority shall be determined by ballot of the Council.

3. Prior to each Annual General Meeting, the President for the ensuing year shall be elected from among and by the Members of the Council. He may be re-elected for the succeeding year, but after a second period of office, he shall not be eligible for election as President until after an interval of four years.

4. Prior to each Annual General Meeting, the Vice-President or Vice-Presidents for the ensuing year shall be elected from among and by the Members of Council.

5. At least thirty days before the date of the Annual General Meeting the Council shall prepare and issue to each Member and Associate Member having a registered address in the United Kingdom, a list of Members for election or re-election nominated to fill the vacancies caused by the retiring Members of Council, such list to contain not less than eight names, and to be regarded as the Balloting List. Every Member and Associate Member of the Institution may submit in writing to the Council the name or names of Members whom he desires to recommend for Council, but such nomination must be delivered to the Secretary not later than the fifteenth day of November in any year, and the Council shall decide by ballot upon the inclusion thereof or otherwise, in the Balloting List. Each Member and Associate Member balloting is entitled to erase any name or names from the Balloting List, and may substitute any other name or names, but any Ballot List shall be deemed invalid if the number of names remaining thereon shall exceed the number required to be elected. The balloting papers shall be returned sealed to the Secretary not later than the time at which the ballot shall be declared closed, and shall be opened only on the day of the Annual General Meeting in the presence of the Council by a Committee appointed for that purpose. The candidates elected to fill the vacancies on the Council shall be those who receive the highest number of votes and such persons so elected, together with the President, Vice-President or Vice-Presidents elected by the Council, and Members of Council who did not resign shall form the Council for the ensuing year.

6. The Council may supply any casual vacancy in the Council (including any casual vacancy in the office of President) which shall occur between one Annual General Meeting and another, and the President, Vice-President or Vice-Presidents, or Members of Council so appointed by the Council shall retire at the succeeding Annual General Meeting.

7. The Council may regulate their own procedure and delegate

any of their powers and discretions to anyone or more of their body. The President shall be *ex-officio* Member of all Committees.

8. The Council shall manage the property, proceedings and affairs of the Institution in accordance with the By-Laws from time to time in force.

9. Committees shall report to the Council, and their decisions shall be subject to confirmation by the Council, excepting in cases where the Committee is given full power to act.

10. The Chairman and Vice-Chairman, and the quorum of Committees, shall be fixed in the Terms of Reference.

11. Additional members may be appointed, or casual vacancies may be filled on Committees, by the Council.

12. The President shall be Chairman at all meetings of the Institution and of the Council, at which he is present, and shall regulate and keep order in the proceedings. In the absence of the President it shall be the duty of the Vice-President or Vice-Presidents to preside in rotation at the meetings of the Institution and of the Council, and to regulate and keep order in the proceedings; but in the case of the absence of the Vice-President or the Vice-Presidents, the members present may elect any Member of the Council to take the Chair: and if no Member of Council be present and willing to take the Chair at a General Meeting of the Institution, the Meeting shall elect a Chairman from the Members or Associate Members present.

13. The Council shall meet as often as the business of the Institution may require; but at least seven days before every Meeting the Secretary shall send notice thereof to each Member of Council, specifying generally the business to be transacted at the Meeting. Business involving the expenditure of funds of the Institution (except by way of payment of current salaries and accounts) shall not be transacted unless specified on the notice calling the Meeting. In the absence of a quorum the meeting shall be adjourned for a period of not less than one week, notice of such adjourned meeting being issued to the Members of Council; and the business for which the Meeting was adjourned may be dealt with by the members present at the adjourned meeting.

14. Any question submitted to Council shall be decided by vote of the majority by a show of hands or by ballot when demanded by any Member present, but a ballot shall be taken and the requisite majority obtained in cases prescribed by any regulations of the Council. At the desire of any five members present, any decision

shall be postponed until the succeeding meeting and then decided by the requisite majority, a notice of the question thus postponed having previously been given in the circular convening the adjourned meeting.

15. It shall be the duty of the Council to adopt every possible means for the advancement of the interests of the Institution and of the objects embraced within its scope; to provide for the proper conduct of the business of the Institution: to make arrangements for the publication of papers read at the Meetings of the Institution, and of such other documents as may be calculated to advance the interests of those connected with the Institution.

SECTION VIII.

Treasurer, Secretary and Auditor. Mode of Appointment and Duties.

1. The Treasurer shall be either a Banker or a Fellow of the Institution of Chartered Accountants, and shall be appointed on the recommendation of the Council, by the Members and Associate Members at a General or Special Meeting, and shall hold office at the pleasure of the Council.

2. The Secretary of the Institution shall be appointed on the recommendation of Council, as and when a vacancy occurs, by the Members and Associate Members at a General or Special Meeting, and shall be a Member or an Associate Member of the Institution. The office of Secretary shall be determinable by six calendar months notice in writing from any date, to be given by the Council or the Secretary (as the case may be) to the other of them. The Secretary shall not necessarily be required to devote the whole of his time to the work of the Institution, provided that due provision is made (to the satisfaction of the Council) for avoidance of delay in carrying out such work.

3. It shall be the duty of the Secretary, under the direction of the Council, to conduct the correspondence of the Institution; to attend all meetings of the Institution, of the Council and of Committees; to take Minutes of the proceedings of such meetings; to read the Minutes of the preceding Meeting and all communications that may be ordered to be read; to superintend the publication of such Papers as the Council may direct; to have charge of the Library; to direct the collection of the Subscriptions and the preparation of the account of the expenditure of

the funds and to present all accounts to the Council for inspection and approval. He shall also engage and be responsible for all persons employed under him, and shall generally conduct the ordinary business of the Institution in accordance with the Articles and By-Laws and the directions of the President and Council; and shall refer to the President in any matters of difficulty or importance requiring immediate decision.

4. The Auditor shall be a Fellow of the Institute of Chartered Accountants and shall be appointed yearly by the Members and Associate Members at a General or Special Meeting, at a remuneration to be fixed by the Members and Associate Members.

SECTION IX.

General Meetings.

1. Ordinary Meetings, the Annual General Meeting, and Special Meetings shall be held in conformity with the Articles of Association.

2. At Ordinary Meetings of the Institution, the Minutes of the previous Meeting shall be read and confirmed; the names of Members, Associate Members, Students and Associates elected or transferred since the previous Meeting shall be declared: papers approved by the Council may be read or accepted as read, and discussion thereon may take place as the Council shall direct; and any other business which shall have been specified on the Notice calling the Meeting, shall be transacted.

3. At the Annual General Meeting of the Institution, the Minutes of the previous Meeting shall be read and confirmed; the result of the ballot of the nominations for the Council shall be declared; the names of Members, Associate Members, Students and Associates elected or transferred since the previous Annual General Meeting shall be declared; the Report of the Council and the Statement of Account shall be submitted; and the appointment of Auditor or Auditors shall then take place; and any other business which shall have been specified on the Notice calling the Meeting, shall be transacted.

4. Every Member, Associate Member, Student and Associate shall have the privilege of introducing one friend to any of the General Meetings (other than Special Meetings); but during such portion of any Meeting as may be devoted to any buisness connected with the management of the Institution, visitors shall

be requested by the Chairman to withdraw, if any Member or Associate Member asks that this be done.

5. Every Member, Associate Member, Student, Associate and Visitor, shall write his name in a book to be kept for that purpose, on entering each Meeting.

6. The proceedings of the Institution shall be published in such manner and at such times as the Council may determine and every Member, Associate Member, Student and Associate, whose Subscription is not in arrear, shall be entitled to receive a copy of all such publications of the Institution.

APPENDIX.

(*Containing Forms referred to in the By-Laws.*)

FORM A.

Name in full.....Designation or Occupation.....
Address.....being.....years of age, and desirous of admission into THE INSTITUTION OF PETROLEUM TECHNOLOGISTS, we,* in consideration of his qualifications, as stated on the annexed sheet, the undersigned proposer and seconder from our personal knowledge, and supporters recommend him in accordance with the By-Laws on the back hereof, as a proper person to belong to the Institution. (In the case of Students, the proposal must be signed by the Principal or Professor of the Candidate's College, or by two Members or Associate Members, in accordance with the By-Law on the back hereof.)

Dated this.....day of.....19....
Proposed from personal knowledge by*.....
Seconded from personal knowledge by*.....
Supported by*.....
Supported by*.....

* Only Members and Associate Members can propose, second or support Candidates, except in the case of Students.

ENGAGEMENT.

I, the undersigned, do hereby agree that, in the event of my election as Member, Associate Member, Student, or Associate, I will be governed by the regulations of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS as they are now formed or as they may hereafter be altered; that I will advance the objects of the Institution as far as shall be in my power, and will attend the meetings thereof as often as I conveniently can; provided that, whenever I shall signify in writing to the Secretary that I am desirous of withdrawing from the Institution, I shall (after the payment of any arrears which may be due by me at that period) be free from this obligation.

Signature of Candidate.....

FORM B.

Name in full.....Designation or Occupation.....
Address.....being.....years of age, and desirous of being transferred into the class of.....of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS, we,* in consideration of his qualifications since joining the Institution, as stated on the back hereof, the proposer and seconder from our personal knowledge, and supporters recommend him, in accordance with the By-Laws on back hereof, as a proper person to be so transferred by the Council.

Dated this.....day of.....19....
Proposed from personal knowledge by*.....
Seconded from personal knowledge by*.....
Supported by*.....
Supported by*.....

* Only Members and Associate Members can propose, second or support Candidates.

FORM C.

DEAR SIR,

I have pleasure in informing you that on the.....day of..... you were elected a.....of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS.

For the ratification of your election (or transfer) in conformity with the By-Laws of the Institution, it is requisite that your Entrance Fee of £.....and your First Annual Subscription of £.....be paid within ....months from the present date, otherwise your election (or transfer) will be void.

You are particularly requested to make all payments on LONDON and to "THE INSTITUTION OF PETROLEUM TECHNOLOGISTS," and crossed "LONDON COUNTY AND WESTMINSTER BANK, LIMITED."

Yours faithfully,

Secretary.

When this form is used for Candidates elected as Students, the Secretary shall cross out the words "your Entrance Fee of £.....and." When this form is used for Candidates transferred to a higher class the Secretary shall insert the word "additional" before "Entrance Fee" (when necessary) and in place of "first" in "First Annual Subscription.'

FORM D.

DEAR SIR,

I am directed by the Council of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS to draw your attention to Clause 8, Section VI, of the By-laws, and to remind you, that the sum of £.....of your annual subscription to the funds of the Institution remains unpaid and that you are in consequence in arrear of subscription. I am also directed to request that you will cause the same to be paid within three calendar months from this date, otherwise the Council will be under the necessity of exercising their discretion, as to using the power vested in them by Clause 18, Section IV, of the By-laws.

Yours faithfully,

Secretary.

FORM E.

DEAR SIR,

I am directed by the Council of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS to inform you, that in consequence of the non-payment of your arrears of subscription, and in pursuance of Clause 18, Section IV, of the By-laws, the Council have declared by special vote on the.....day of.....19..., that you have forfeited your claims in future to belong to the Institution, and your name will be in consequence expunged from the Register or Lists, unless payment is made previous to.....

But notwithstanding such forfeiture as regards the future, I am directed to call upon you for payment of your arrears amounting to £.....

Yours faithfully,

Secretary.

FORM F.

DEAR SIR,

I am directed by the Council of THE INSTITUTION OF PETROLEUM TECHNOLOGISTS to inform you that by a Resolution passed at a special meeting of the Council on the.....day of..... they have, acting under the powers conferred upon them by Clause 19, Section IV, of the By-Laws of the Institution, ordered your name to be erased from the Register, and have declared you to be no longer a..... of the Institution.

Yours faithfully,

Secretary.

List of Honorary Members, Members, Associate Members, Students, and Associates of The Institution of Petroleum Technologists.

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*The mark * against a name indicates a Founder Member.*

" " § " " " " *a Member who agreed to become such prior to the Foundation.*

" " † " " " " *an Original Member.*

" " ‡ " " " " *a Life Member.*

" " ✠ " " " " *an Author of a Paper published in the* Transactions *of the Institution.*

Year of Election.	
	HONORARY MEMBERS. (Hon.M.Inst.P.T.)
1913	§Day, Dr. David T., Department of the Interior, United States Geological Survey, Washington, D.C.
1913	§Engler, Geheimer Rat *Professor* Dr. Carl, Kaiserstrasse 12, Karlsruhe, i/B., Germany.
	MEMBERS. (M.Inst.P.T.)
1913	*Adams, Alfred C., (*Member of Council*), 101, Leadenhall Street, London, E.C.
1913	*Allen, Herbert, (*Member of Council*), 31, Budge Row, London, E.C.
1914	‡Andrew, Dr. Arthur Robert, D.Sc., F.G.S., M.Inst.M.M., c/o Anglo-Saxon Petroleum Co., Ltd., Miri, Sarawak.
1914	†Anfilogoff, Nicholas Alexander, Thames Haven, Essex.
1913	*Armstrong, James Tarbotton, 22, Great St. Helen's, London, E.C.
1914	†Ashmore, George Percy, M.Inst.M.E., M.Inst.M.M., 95, Linden Gardens, London, W.

1914 †Bailey, Tom Esmond Geoffrey, F.G.S., c/o Anglo-Saxon Petroleum Co., Ltd., Miri, Sarawak.

1913 *Balfour, *Sir* Robert, Bart., M.P., (*Member of Council*), 7, Gracechurch Street, London, E.C.

1914 †Barringer, Herbert, M.Inst.C.E.,M.I.Mech.E.,M.I.N.A., M.Inst.Mar.Eng., 78, Gracechurch Street, London, E.C.

1913 §Beazley, Arthur T., B.Sc., Assoc.M.Inst.C.E., c/o California Oilfields, Ltd., Coalinga, California, U.S.A.

1913 *‡Beilby, Dr. George T., LL.D., F.R.S., (*Member of Council*), 11, University Gardens, Glasgow, Scotland.

1914 §Bird, William Loraine Wilberforce, Winchester House, Old Broad Street, London, E.C.

1913 *‡Blundstone, Edwin Richardson, B.A., F.C.S., (*Member of Council*), 79, York Street, Westminster, London, S.W.

1913 §Böckh, *Professor* Dr. Hugo von, Selmeczbanya, Bányáizate Föiskala, Hungary.

1913 §Bosworth, Dr. T. O., B.A., D.Sc., F.G.S., 12, St. Giles Street, Northampton.

1913 *Bowring, *Sir* Thomas B., 7, Palace Gate, Kensington, London, W.

1913 §Bradshaw, Herbert Edward, A.R.S.M., Assoc.Inst. M.M., Royal Colonial Institute, Northumberland Avenue, London, W.C.

1914 †Burgess, Thomas Clarkson Jack, 43, Ridgemount Gardens, Bedford Square, London, W.

1913 §Burford, James Wilfrid, M.Inst.M.E., A.M.I.E.E., c/o Lobitos Oilfields, Ltd., Lobitos, Peru.

1914 †Burls, Herbert Thomas, F.G.S., M.Inst.M.E., M.Inst. M.M., 2, Verulam Buildings, Grays Inn, London, W.C.

1914 †Butterfield, John Cope, F.I.C., M.Inst.M.M., F.C.S., 79, Endlesham Road, Balham, London, S.W.

1913 *‡Cadman, *Professor* John, D.Sc., M.Inst.C.E., M.Inst. M.M., (*Member of Council*), The University, Birmingham.

1913		§Calder, William, M.Inst.M.E., 7, Coleraine Road, Blackheath, London, S.E.
1913		§Campbell, John, c/o The Lobitos Oilfields, Ltd., Lobitos, Peru.
1913		*‡Cargill, John Trail, (*Member of Council*), 175, West George Street, Glasgow.
1914		†Carruthers, Robert George, F.G.S., H.M. Geological Survey, 33, George Square, Edinburgh.
1913		§Chambers, A.E., c/o Minatitlan Refinery, Minatitlan, Vera Cruz, Mexico.
1913		§Chambers, D.M., M.Inst.M.E., Norfolk House, Laurence Pountney Hill, London, E.C.
1913		§Chapman, Stanley H., Rantau Pandjang, Tandjong Poera, Langkat, Sumatra, O.K.
1913		§Clarkson, Thomas, c/o The London & Pacific Petroleum Co., Ltd., Talara, Peru.
1914		†Cooper, Vivian Boulton Douglas, Assoc.M.Inst.C.E., M.Inst.E.E., 22, Buckingham Gate, Westminster, London, S.W.
1913		§Cooper-Key, *Major* Aston, C.B., (*Member of Council*), 109, Philbeach Gardens, London, S.W.
1913		*‡Cowdray of Midhurst, Rt. Hon. Lord,(*Vice-President*), 47, Parliament Street, Westminster, London, S.W.
1913	✠	*Craig, E. Hubert Cunningham, B.A., F.G.S., 5–6, Abbey Buildings, Princes Street, London, S.W.
1913		§Dabell, A. Frank, Baku Russian Petroleum Co., Born, Baku, South Russia.
1913		§Dabell, Charles, Anglo Maikop Corporation, Krimskaya, South Russia.
1913		§Dalton, William Herbert, F.G.S., F.C.S., 17, Gracechurch Street, London, E.C.
1913		*Dick, W. Bruce, 33, Eastcheap, London, E.C.
1914		†Duckham, Alexander, F.C.S., Vanbrugh Castle, Blackheath, London, S.E.

1913 *‡Eastlake, Arthur William, M.Inst.M.E., A.M.I.Mech.E., (*Member of Council*), 17, Gracechurch Street, London, E.C.

1914 †Evans, William, Clynderwen House, Grosvenor Road, Chiswick, London, W.

1913 §Forbes, Edmund Batten, M.Inst.C.E., 51, Onslow Gardens, London, S.W.

1914 §Foster, Harry Seymour, F.G.S., 82, Victoria Street, Westminster, London, S.W.

1914 †Funck, George Henry, 101, Leadenhall Street, London, E.C.

1914 †Garratt, Ernest Albert, M.I.Mech.E., M.A.S.Mech.E., 78, Gracechurch Street, London, E.C.

1914 †Garrett, Thomas Richard Henry, M.A., F.G.S., R.S.A., Royal Societies Club, St. James's Street, London, S.W.

1914 †Gould, Dr. Charles Newton, Ph.D., F.G.S.A., F.A.Assoc.A.Sc., 408, Terminal Buildings, Oklahoma City, Oklahoma, U.S.A.

1913 *Greenway, Charles, (*Member of Council*), Winchester House, London, E.C.

1914 †Hall, William Augustus, Chemists Club Building, 50, East 41st Street, New York, U.S.A.

1913 *‡Hamilton, James, 175, West George Street, Glasgow.

1913 *Hay, John, 138, Leadenhall Street, London, E.C.

1914 †Harker, Dr. John Allen, D.Sc., F.R.S., R.S.L., 'Alston,' Queens' Road, Teddington, Middlesex.

1913 *‡Henderson, Dr. James Alexander Leo, Ph.D., F.G.S., M.Inst.M.M., 3, London Wall Buildings, London, E.C.

1914 †Henderson, Dr. William Hope, Ph.D., M.Inst.M.E., M.Inst.M.M., 1, Kingswood Road, Upper Norwood, London, S.E.

1913 ✠ *Holland, Sir Thomas Henry, K.C.I.E., F.R.S., (*Member of Council*), The University, Manchester.

1914 †Howell, George, F.G.S., 23, Crowhurst Road, Brixton, London, S.W.

1914 †Kewley, James, M.S.Chem.Ind., Suez, Egypt.

1913 *Lane, Frederick, 26, Great St. Helen's, London, E.C.

1913 ✠ *Lewes, *Professor* Vivian B., F.I.C., F.C.S., (*Member of Council*), Royal Naval College, Greenwich, London, S.E.

1913 §Lohmann, Dr., Minatitlan Refinery, Minatitlan, Vera Cruz, Mexico.

1914 †MacGarvey, Dr. Frederick James, Ph.D., Arenbergring 16, Vienna III, Austria.

1913 *‡MacGarvey, William H., 1 Seilerstätte, 13, Vienna I, Austria.

1913 §Macnab, William, F.I.C., 10, Cromwell Crescent, London, S.W.

1913 §Macrorie, Basil Francis Newall, F.G.S., 17, Stanmore Avenue, Port-of-Spain, Trinidad, British West Indies.

1914 †May, Herbert, 14, Micheldever Road, Lee, London, S.E.

1914 †McMullen, Wallace, M.J.I.E., 17, Gracechurch Street, London, E.C.

1913 *‡Milne, Alexander, 145, Dashwood House, London, E.C.

1914 †Ormandy, William Reginald, 53A, Barton Arcade, Manchester.

1913 §Otto, Rudolf, Spasskaia 177, Baku, South Russia.

1913 *‡Palmer, Thomas Cassinet, Assoc.M.Inst.C.E., (*Member of Council*), W. J. Fraser & Co., Ltd., Dagenham, Essex.

1913		†Perkin, Dr. Frederick Mollwo, F.I.C., F.C.S., F.S.Chem.Ind., (*Member of Council*), 199, Piccadilly, London, W.
1914		†Rappoport, Frederick Gerald, M.I.Mech.E., Norfolk House, Laurence Pountney Hill, London, E.C.
1913	✠	*‡Redwood, Sir Boverton, Bart., D.Sc., F.R.S.E., (*President*), 4, Bishopsgate, London, E.C.
1913		*‡Redwood, Robert, F.C.S., (*Member of Council*), 4, Bishopsgate, London, E.C.
1913		§Rosenplaenter, Carlos Bernard, M.Inst.M.E., M.Inst.M.M., 2, Elmbourne Road, Tooting Bec Common, London, S.W.
1913		§Sandeman, *Capt.* Alfred, Yenangyoung, Upper Burma.
1913		*‡Sillem, Herman Walter, 145, Dashwood House, New Broad Street, London, E.C.
1913		*Smellie, William, Tower Buildings, 22, Water Street, Liverpool.
1913		§Stewart, Phillip Charteris Anstruther, A.R.S.M., F.G.S., Assoc.M.Inst.M.M., 51, Redcliffe Square, South Kensington, London, S.W.
1913		§Sutherland, David Alexander, F.I.C., Victoria Mansions, 26, Victoria Street, London, S.W.
1913		§Sutton, William, M.Inst.M.E., 'Grosmont,' 46, Palace Road, Streatham Hill, London, S.W.
1913		*‡Tweedy, George, 7, Angel Court, London, E.C.
1913		*Wallace, Charles W., Winchester House, London, E.C.
1914		†Wells, John, F.G.S., 56, Moorgate Street, London, E.C.
1913		§Zaturoff, Schamir, Baku, South Russia.

ASSOCIATE MEMBERS. (A.M.Inst.P.T.)

1914 †Berry, Arthur George Vale, M.S.Chem.Ind., 'Ardenconnel,' Warwick Road, Sutton, Surrey.

1913 §Brown, Charles Barrington, A.R.S.M., F.G.S., c/o Lobitos Oilfields, Ltd., Lobitos, Peru.

1914 †Carter, Ashley, 26, Lancaster Park, Richmond, Surrey.

1914 †Coe, Richard John, 115, South Park Road, Wimbledon, London, S.W.

1913 §Davson, Cyril W., A.M.I.Mech.E., 42, Lansdowne Crescent, Notting Hill, London, W.

1913 §Dewhurst, T., A.R.C.Sc., F.G.S., c/o The Burmah Oil Co., Ltd., Nyounghla, Upper Burma.

1913 §Esling, F.,

1914 †Edwards, George William, M.InstM.E., A.M.Inst.M.M., 3, London Wall Buildings, London, E.C.

1914 §Fordham, William Herbert, M.A., Odsey, Ashwell, Baldock, Herts.

1914 †Groeling, Albrecht Eugen von, 3, Lombard Street, London, E.C.

1913 §Hall, John E. Marshall, A.R.S.M., Eastchurch, Isle of Sheppey, Kent.

1913 §Halse, George Whitfield, B.Sc., Assoc.M.Inst.C.E., F.G.S., 15, Clarendon Road, Holland Park, London, W.

1914 †Harland, Alfred, c/o Anglo-Saxon Petroleum Co., Ltd., Miri, Sarawak.

1913 §Holiday, Francis Augustus, A.R.C.Sc., F.G.S., Whitwell, Welwyn, Herts.

1914 †Hoskyns, Oswale Peyton Latham, A.M.I.Mech.E., A.M.Inst.E.E., 57, Bishopsgate, London, E.C.

1914 †Hunting, Gerald Lindsay, Milburn House, Newcastle-on-Tyne.

1914 †Hunting, Percy Llewellyn, Milburn House, Newcastle-on-Tyne.

1913 §James, Samuel Lister, F.G.S., 17, Gracechurch Street, London, E.C.

1914 †Jones, Wyndham, R.S.A., c/o Anglo-Saxon Petroleum Co., Ltd., Miri, Sarawak.

1914 †Loe, James Leslie, 24, Oakwood Avenue, Roundhay, Leeds.

1914 §Lepper, Gordon Willis, c/o The Burmah Oil Co., Ltd., Nyounghla, Upper Burma.

1913 §Lomax, Ernest Lawson, M.Sc., F.C.S., c/o G. W. Lomax, Mowbreck, Farington, *near* Preston, Lancs.

1914 †MacDougall, Alexander, Assoc.M.Inst.C.E., 'Oakhurst,' Westcombe Park, London, S.E.

1914 †MacKenzie, Robert Harman, 57, Bishopsgate, London, E.C.

1914 †Manfield, William Hardy, Portesham House, Portesham, Dorchester.

1914 †McAlpine, Charles William, c/o Anglo-Saxon Petroleum Co., Ltd., Miri, Sarawak.

1913 §Moon, Frederick William, F.G.S.,

1914 †Nash, Alfred William, A.M.I.Mech.E., Apsheronskaia, South Russia.

1913 §Neilson, R. G., c/o The Burmah Oil Co., Ltd., P.O. Box 67, Rangoon, Burma.

1914 †Ockenden, Maurice Albion, F.G.S., M.I.Mech.E., Dashwood House, London, E.C.

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